Name:

Common Core Algebra II

Unit 4

Functions and Key Points

Mr. Schlansky

Lesson 1: I can determine the domain by finding where the graph starts and ends from left to right and determine the range by finding where the graph starts and ends from bottom to top.
Domain: Hold pen vertically and travel left to right to find where graph starts and ends.
Range: Hold pen horizontally and travel bottom to top to find where graph starts and ends.

Lesson 2: I can write intervals in both interval notation and set builder notation
Interval notation:
Where the graph starts and stops from left to right
Set builder notation:
If there is an infinity involved, x comes first.
If there is not an infinity involved, $a < x < b$

Lesson 3: I can determine the intervals where functions are increasing, decreasing, positive, and negative by finding the x value where each interval starts and stops.
Increasing: The function goes "uphill" from left to right
Decreasing: The function goes "downhill" from left to right
Positive: The function is above the x axis
Negative: The function is below the x axis

Lesson 4: I can find key points of a graph using the 2^{nd} Trace (Calc) Menu in my graphing calculator.
The zeros (x-intercepts) are where the graph hits the x axis. 2^{nd} Trace (Calc), zeros, left bound (move cursor to the left of the point and hit enter), right bound (move cursor to the right of the point and hit enter), enter.
The y-intercept is when x is 0. Find this value in your table.
Local extrema are the turning points (minimum and maximum). 2^{nd} Trace (Calc), minimum/maximum, left bound (move cursor to the left of the point and hit enter), right bound (move cursor to the right of the point and hit enter), enter.

Lesson 5: I can determine where functions are increasing/decreasing and positive/negative by stating the *x* value of where each piece starts and stops from left to right using my graphing calculator.
Increasing/Decreasing:
-Find the relative minimums and maximums using 2^{nd} Trace Menu
-Use Lesson 3 to write the intervals where each piece starts and stops
Positive/Negative:
-Find the zeros using the 2^{nd} Trace Menu
-Use Lesson 3 to write the intervals where each piece starts and stops

Lesson 6: I can solve systems of equations graphically using my graphing calculator to find the point(s) of intersection.

Systems of Equations Graphically Using TI-84+ ($f(x) = g(x)$)

1) Type equations into Y_1 and Y_2
2) Zoom 6 (Standard) is your standard window. Adjust window OR try Zoom 0(Fit) if you don't see what you want to see.
3) 2nd Trace (Calc), 5 (Intersect)
4) Place cursor over point of intersection, hit enter, enter, enter. Repeat the process for any other points of intersection.

*The solutions to the system of equations are the x values of the intersections.

Lesson 7: I can transform functions using the translation and reflection rules.

Translations (+ or -)

If adding to f(x), the graph moves up or down

If adding to x, the graph moves left or right (the opposite direction in which you would think)

$y = f(x) + a$ moves UP a units

$y = f(x) - a$ moves DOWN a units

$y = f(x + a)$ moves LEFT a units

$y = f(x - a)$ moves RIGHT a units

Reflection (-)

Reflect over the axis that you are *not* negating.

$y = -f(x)$, reflection over the x – axis (negate the y, reflect over the x)

$y = f(-x)$, reflection over the y – axis (negate the x, reflect over the y)

Lesson 8: I can find the average rate of change of a function using $\frac{y_2 - y_1}{x_2 - x_1}$.

Average rate of change: $\frac{y_2 - y_1}{x_2 - x_1}$

ALWAYS CREATE A TABLE

If given a table: circle the values in the table and do $\frac{bottom - top}{bottom - top}$

If given a graph: create a table and pull the y values from the graph. Then circle the values in the table and do $\frac{bottom - top}{bottom - top}$.

If given an equation: create a table by typing into Y= and going to 2nd Graph (Table). Then circle the values in the table and do $\frac{bottom - top}{bottom - top}$.

Lesson 9: I can find the average rate of change and write a context sentence using $\frac{y_2 - y_1}{x_2 - x_1}$ and the given script.

Average rate of change: $\frac{y_2 - y_1}{x_2 - x_1}$

"On average, from x to x, the y topic is increasing/decreasing by AROC y units per x unit"

Lesson 10: I can determine which intervals have the fastest and slowest average rate of change by looking at the slopes (graph) or calculating the AROC for each interval (table).

Average rate of change: $\frac{y_2 - y_1}{x_2 - x_1}$

Graphs: The steeper the slope, the greater the average rate of change. The flatter the slope, the slower the average rate of change.

Tables: Calculate the average rate of change for each interval.

Lesson 11: I can find the inverse of a function by switching x and y and solving for y.

Inverse of a function $f^{-1}(x)$:
Switch x and y, solve for y

If multiple choice:
Type the original equation into y = and pull a few nice points from the table
Switch x and y in your table
Type in each choice and see which has the switched points in its table

Lesson 12: I can determine if functions are even, odd, or neither by determining if it is symmetric to the y axis or the origin.
IF GIVEN AN EQUATION, TYPE INTO Y=!!!
Even Functions: Symmetric to the y-axis
Odd Functions: Symmetry to the origin (Turn it upside down and see the exact same thing)

Lesson 13: I can prepare for my exam by practicing!

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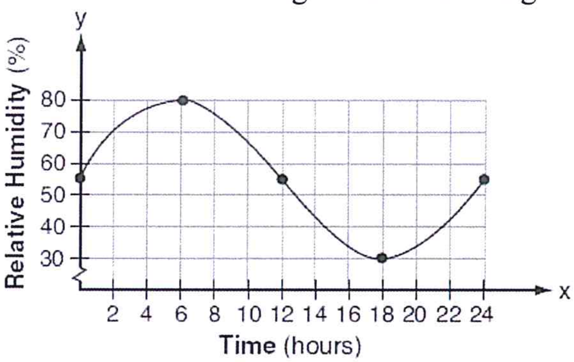
Mr. Schlansky Algebra II

Domain and Range

State the domain and range of the following functions in interval and set builder notation

1.



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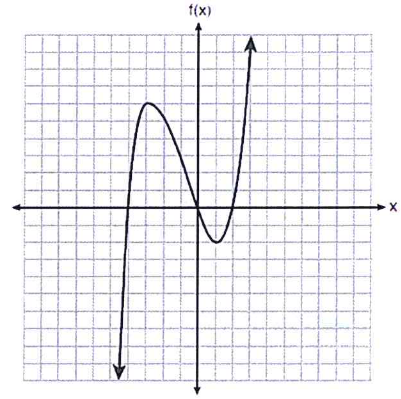

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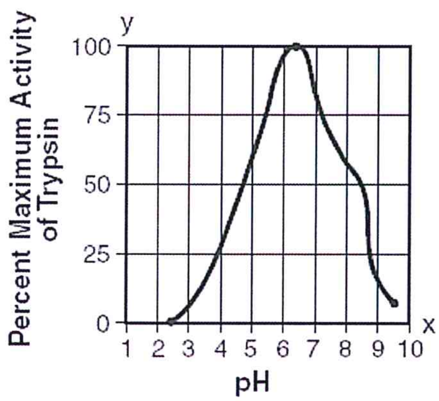

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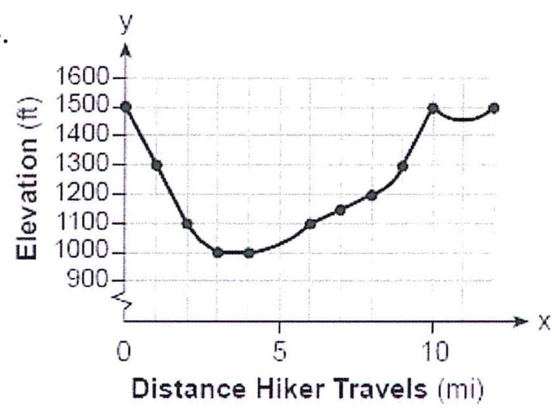

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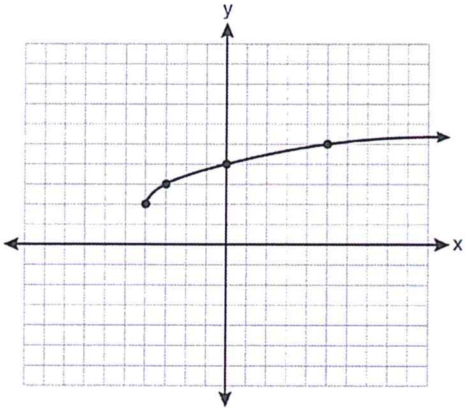

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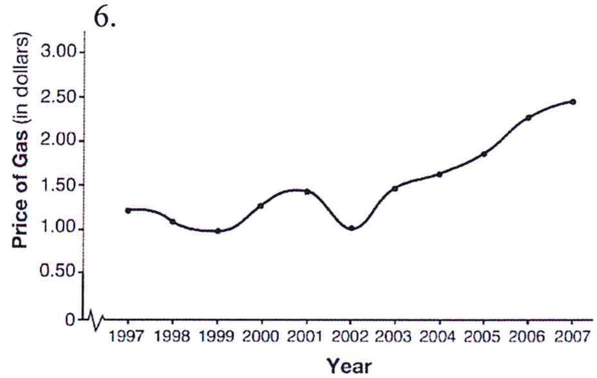
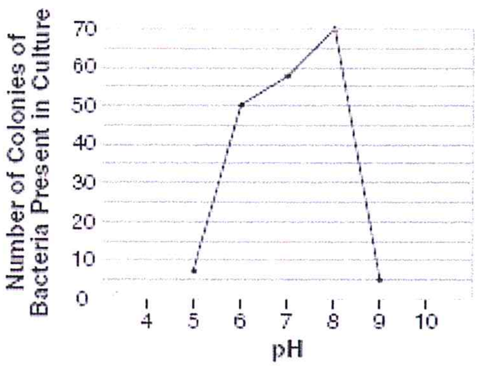
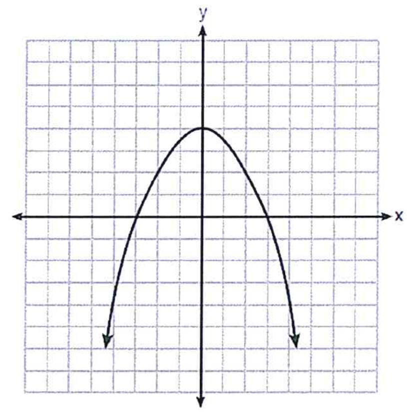
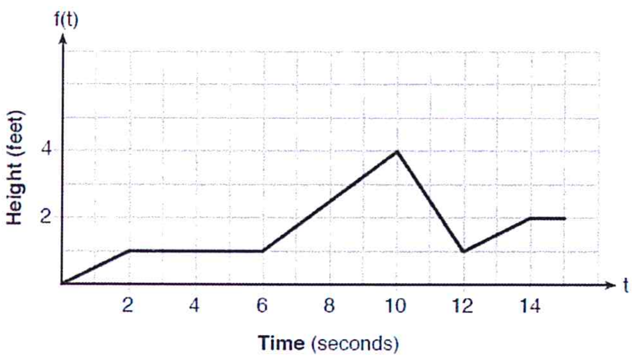
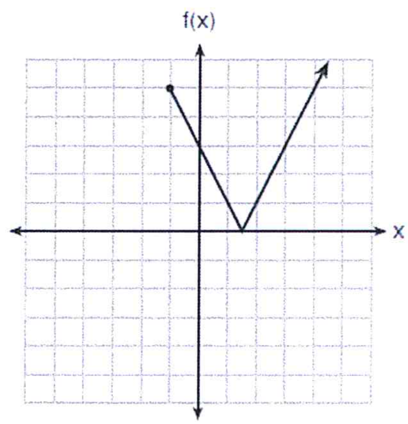


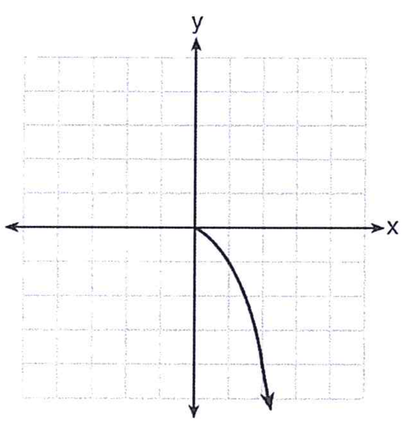

Number of Colonies of Bacteria Present in Culture
70
60
50
40
30
20
10
0
4
5
6
7
8
9
10
pH


y
x

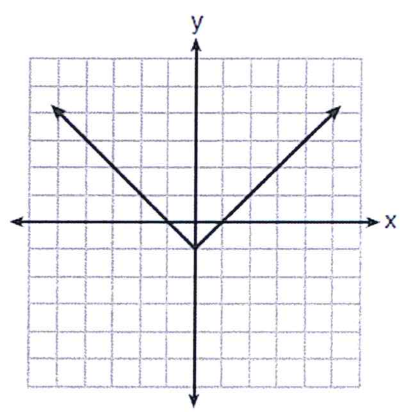

f(t)
Height (feet)
4
2
2
4
6
8
10
12
14
t
Time (seconds)


f(x)
x

11.


y
x

12.


y
x

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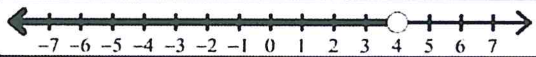
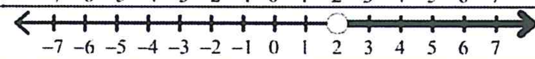
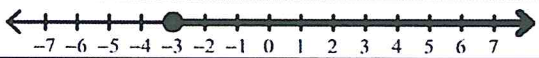
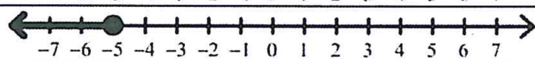
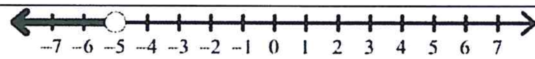
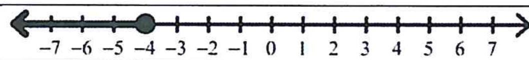
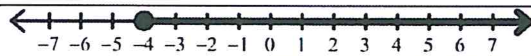
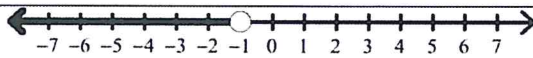
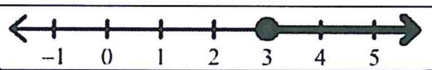
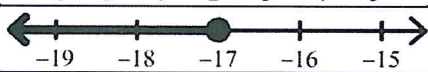
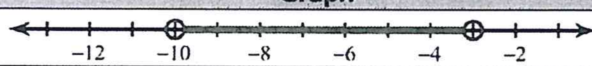
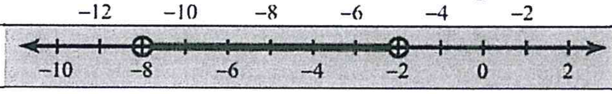
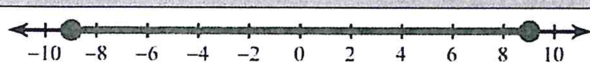
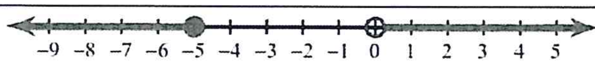
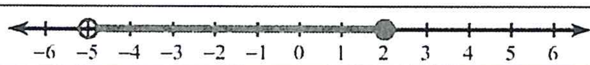
Interval Notation and Set Builder Notation

For each graph, write the appropriate interval in both set and interval notation.

	Graph	Set Notation	Interval Notation
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

	Graph	Set Notation	Interval Notation
11			
12			
13			
14			
15			
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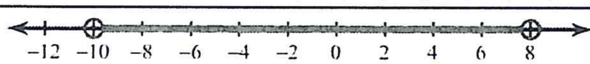
17			

	Graph	Set Notation	Interval Notation
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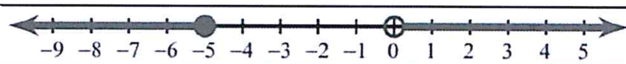
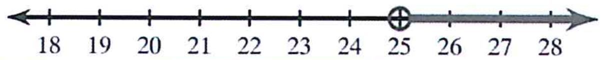
19			
20			
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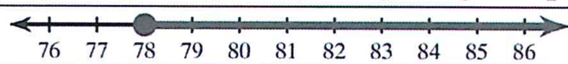
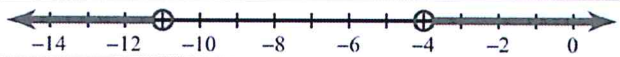
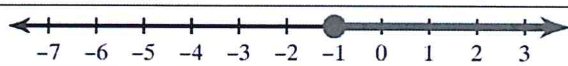
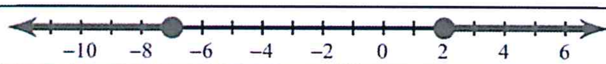
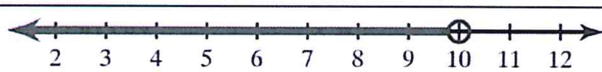
22			
23			
24			
25			
26			
27			

Name ______________
Mr. Schlansky

Date _________
Algebra II

Intervals

1. $f(x) = x^3 + 2x^2 - 9x - 18$
Shape: positive odd

y-intercept:
−18

x-intercepts (zeros):
{-3,-2,3}

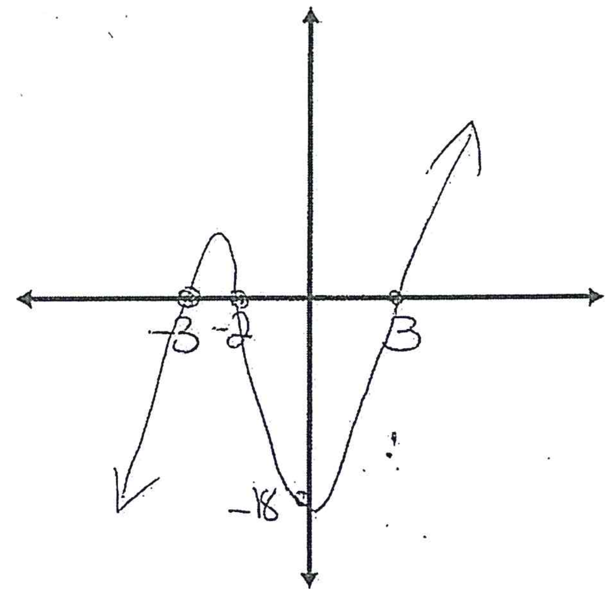
End Behavior:
left $x \to -\infty$, $f(x) \to$ −∞ down
$x \to \infty$, $f(x) \to$ ∞
right up

increasing

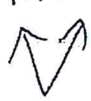
decreasing

positive

negative



2. $f(x) = x^4 - 10x^2 + 9$
Shape:
positive even



y-intercept: 9

x-intercepts (zeros):
{-3,-1,1,3}

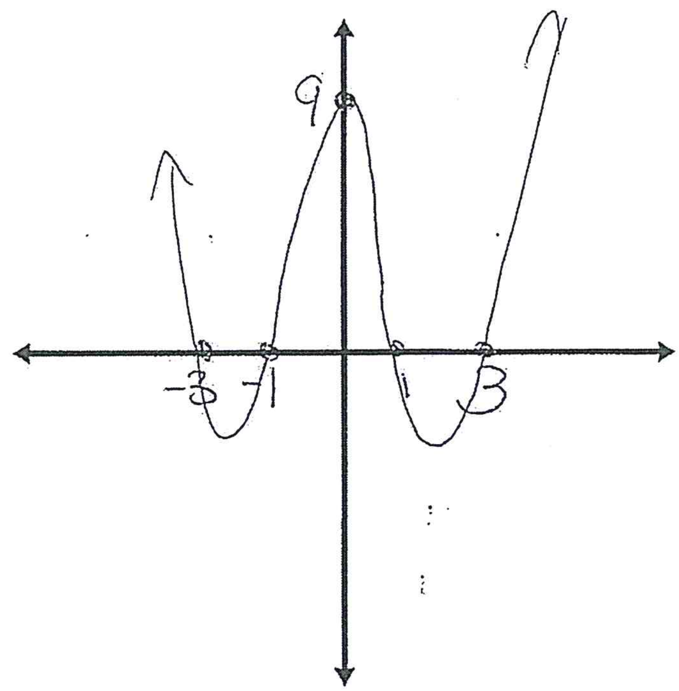
End Behavior:
left $x \to -\infty$, $f(x) \to$ ∞ up
$x \to \infty$, $f(x) \to$ ∞
right up

increasing

decreasing

positive

negative



3. $p(x) = -x^3 - 3x^2 + 4x + 12$

Shape: negative odd   increasing

y-intercept: decreasing

12

x-intercepts (zeros):   Positive

{-3,-2,2}

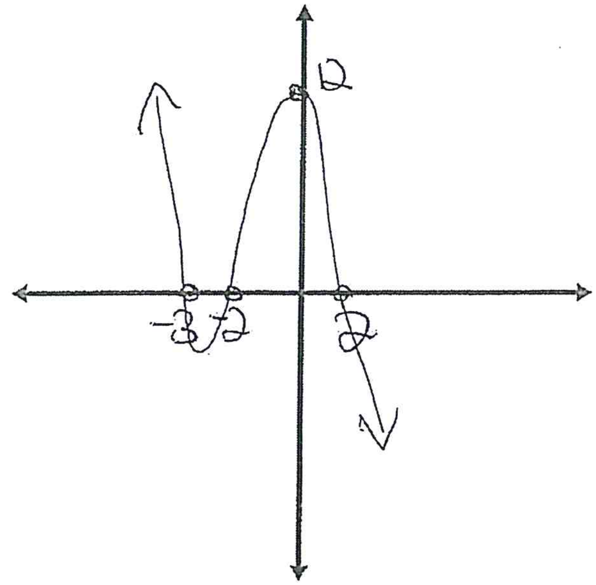
End Behavior: up   negative

left

$x \to -\infty,\ f(x) \to \infty$

$x \to \infty,\ f(x) \to -\infty$

right   down



4. $f(x) = -x^4 + 3x^3 + 10x^2 + 0$

Shape:

negative even   increasing

decreasing

y-intercept:

0

x-intercepts (zeros):   positive

{-2,0,0,5}

double root bounces off

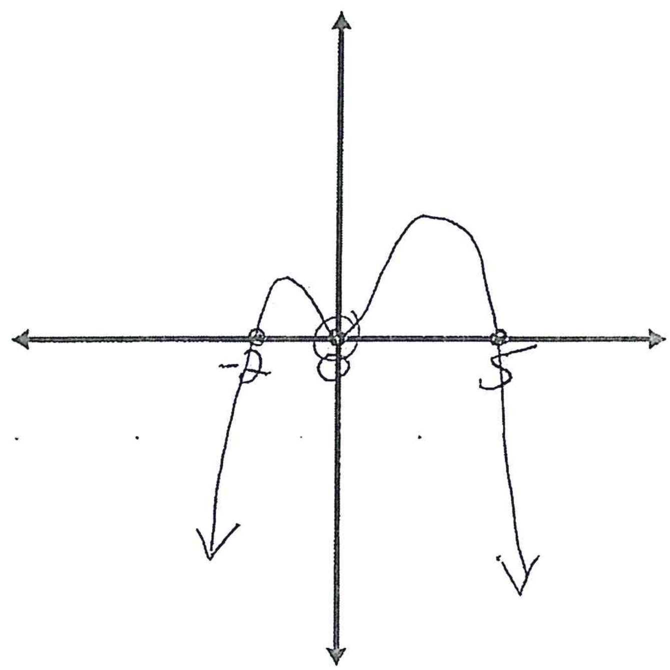
End Behavior: down   negative

left

$x \to -\infty,\ f(x) \to -\infty$

$x \to \infty,\ f(x) \to -\infty$

right   down



5. $p(x) = x^3 - 3x^2 - 9x + 27$

Shape: positive odd increasing

decreasing

y-intercept:

27

x-intercepts (zeros):

{-3,(3,3)}

double root bounces off

positive

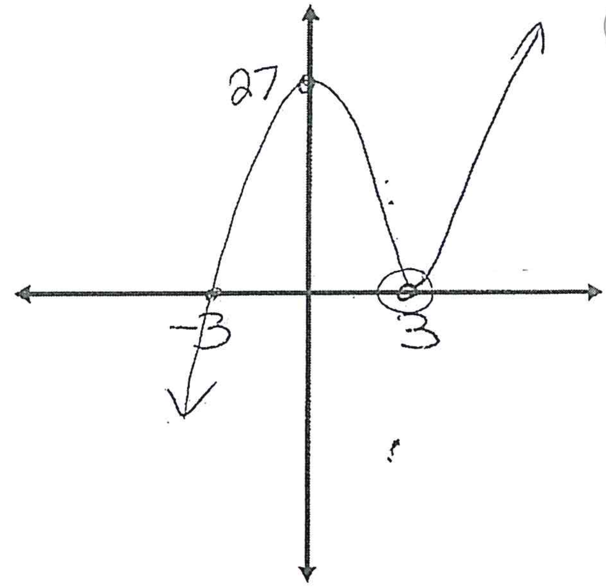
End Behavior:

left $x \to -\infty$, $f(x) \to -\infty$ down

$x \to \infty$, $f(x) \to \infty$

right up

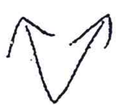
negative



6. $h(x) = x^6 - 5x^4 + 4x^2$

Shape:

positive even increasing



decreasing

y-intercept:

0

x-intercepts (zeros):

{(0,0),1,4}

double root bounces off

positive

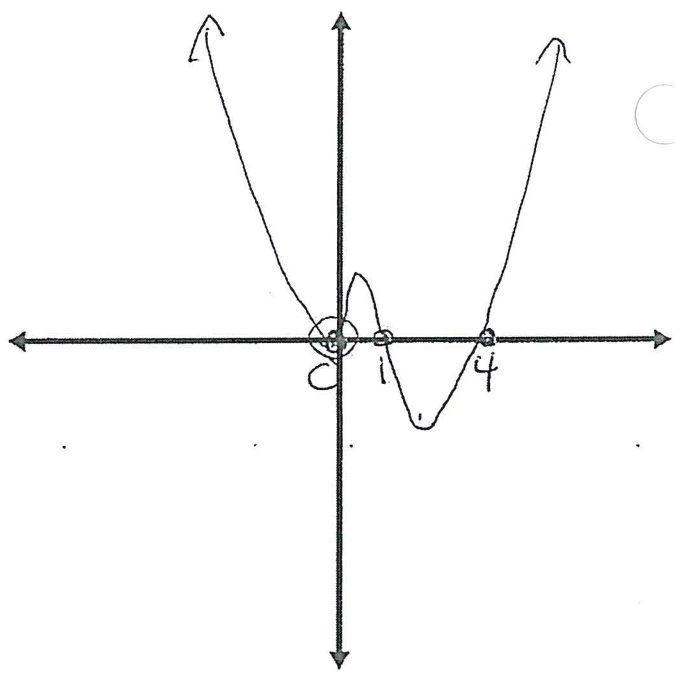
End Behavior:

left $x \to -\infty$, $f(x) \to \infty$ up

$x \to \infty$, $f(x) \to \infty$

right up

negative



7. $f(x) = x^4 + 11x^3 + 15x^2 - 25x$

Shape: positive even

increasing

y-intercept:

0

decreasing

x-intercepts (zeros):

{(-5,-5),0,1}

double root bounces off

positive

End Behavior:

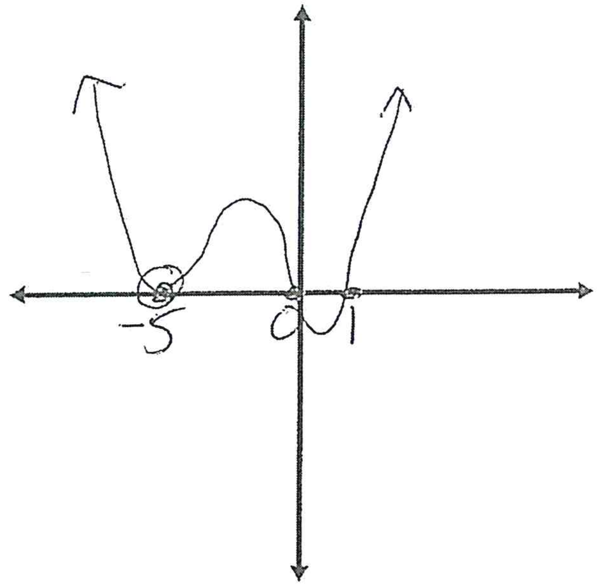
left up

$x \to -\infty,\ f(x) \to \infty$

$x \to \infty,\ f(x) \to \infty$

right up

negative



8. $g(x) = -x^5 + 5x^4 + 8x^3 - 44x^2 - 32x + 64$

Shape: negative odd

increasing

y-intercept:

64

decreasing

x-intercepts (zeros):

{(-2,-2),1(4,4)}

double roots bounce off

positive

End Behavior:

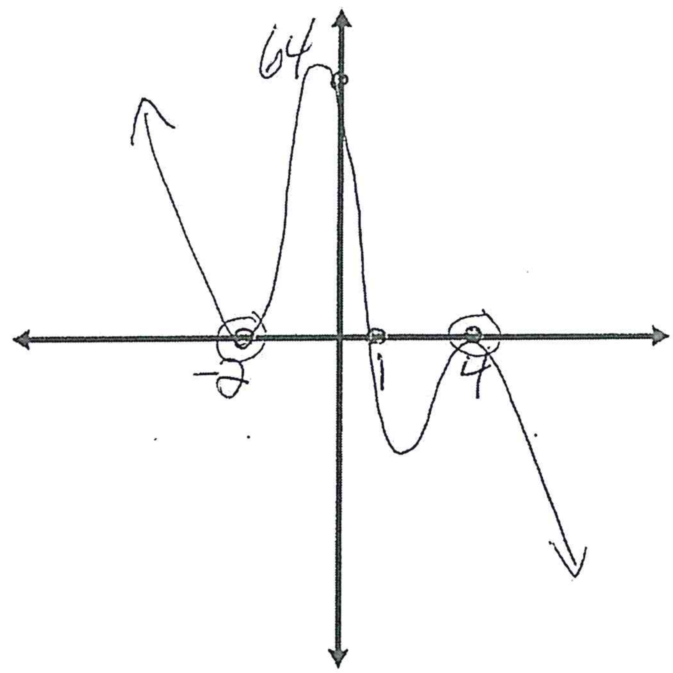
left up

$x \to -\infty,\ f(x) \to \infty$

$x \to \infty,\ f(x) \to -\infty$

right down

negative



Name ____________ Date ________________

Mr. Schlansky Algebra II

Finding Key Points

1. Given the function $f(x)=x^3+3x^2-x-2$, find the zeros and relative extrema to the *nearest tenth.*

2. Given the function $f(x)=-x^3-2x^2+2x+3$, find the zeros and relative extrema to the *nearest tenth.*

3. Given the function $f(x)=x^4-8x^2+x+8$, find the zeros and relative extrema to the *nearest tenth.*

4. Given the function $f(x)=-x^4+3x^2-1$, find the zeros and relative extrema to the *nearest tenth.*

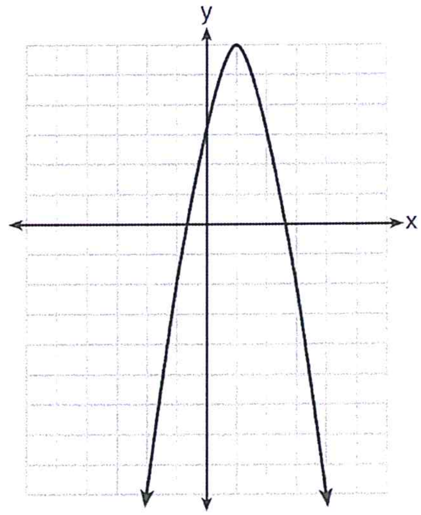
5. Given the function $f(x) = 2x^3 - 11x^2 - 14x + 26$, find the zeros and relative extrema to the *nearest tenth*

6. Given the function $f(x) = -3x^3 - 20x^2 - 10x + 8$, find the zeros and relative extrema to the *nearest tenth.*

7. Given the function $f(x) = -x^4 + 15x^2 - 7$, find the zeros and relative extrema to the *nearest tenth.*

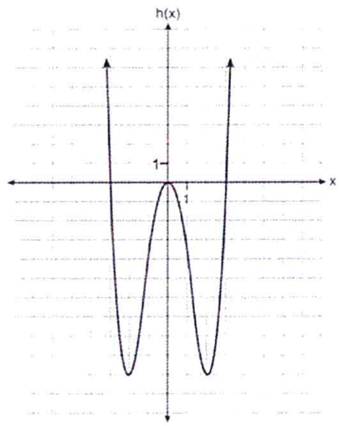
8. Given the function $f(x) = x^3 + 8x^2 + 3x - 8$, find the zeros and relative extrema to the *nearest tenth*

9. Let f be the function represented by the graph below.
Let g be a function such that $g(x) = -\frac{1}{2}x^2 + 4x + 3$.
Determine which function has the larger maximum value.
Justify your answer.



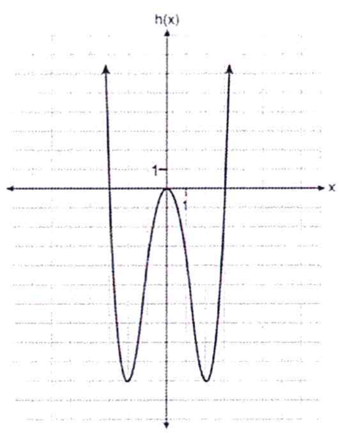
10. Which graph has a smaller relative minimum?

$g(x) = x^3 + 4x^2 - 2x - 10$



11. Which graph has the largest zero?

$g(x) = x^3 + 4x^2 - 2x - 10$



12. Which quadratic function has the largest maximum?

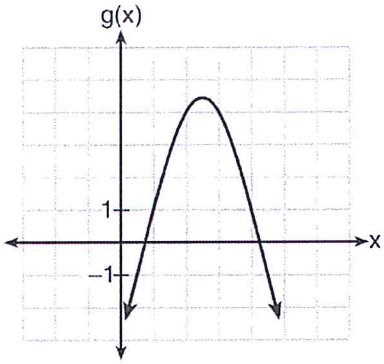
1) $h(x) = (3 - x)(2 + x)$

2)

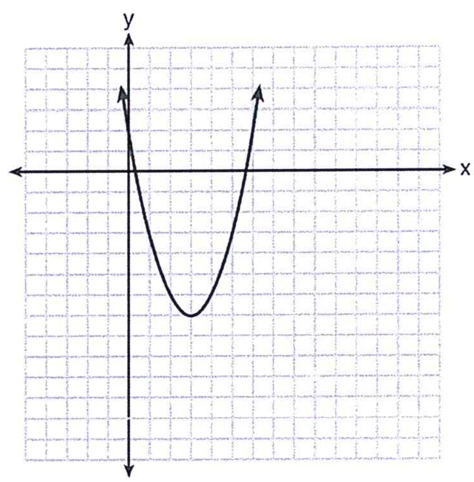
x	f(x)
−1	−3
0	5
1	9
2	9
3	5
4	−3

3) $k(x) = -5x^2 - 12x + 4$

4)



13. The graph representing a function is shown below.



Which function has a minimum that is *less* than the one shown in the graph?

1) $y = x^2 - 6x + 7$

2) $y = |x + 3| - 6$

3) $y = x^2 - 2x - 10$

4) $y = |x - 8| + 2$

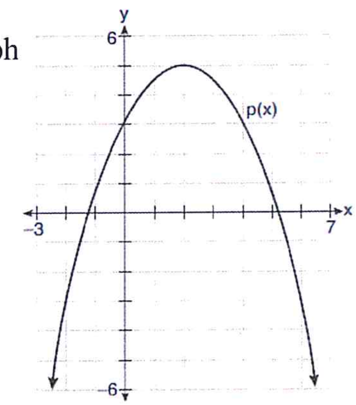
14. Which of the following functions has the greatest zero?

$f(x) = x^2 - 6x + 7$

$g(x) = x^2 - 2x - 10$

15. Consider $f(x) = 4x^2 + 6x - 3$, and $p(x)$ defined by the graph below. The difference between the values of the maximum of p and minimum of f is

1) 0.25 3) 3.25
2) 1.25 4) 10.25



16. The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$. To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

17. A manufacturer of sweatshirts finds that profits and costs fluctuate depending on the number of products created. Creating more products doesn't always increase profits because it requires additional costs, such as building a larger facility or hiring more workers. The manufacturer determines the profit, $p(x)$, in thousands of dollars, as a function of the number of sweatshirts sold, x, in thousands. This function, p, is given below. Over the interval $0 \leq x \leq 9$, state the coordinates of the maximum of p and round all values to the *nearest integer*. Explain what this point represents in terms of the number of sweatshirts sold and profit. Determine how many sweatshirts, to the *nearest whole sweatshirt*, the manufacturer would need to produce in order to first make a positive profit. Justify your answer.

$p(x) = -x^3 + 11x^2 - 7x - 69$

Name ____________ Date ________________

Mr. Schlansky Algebra II

Intervals with Key Points

1. Over what intervals are $f(x)=x^3+3x^2-x-2$:

Increasing Decreasing Positive Negative

2. Over what intervals are $f(x)=-x^3-2x^2+2x+3$:

Increasing Decreasing Positive Negative

3. Over what intervals are $f(x)=-x^4+15x^2-7$:

Increasing Decreasing Positive Negative

4. Over what intervals are $f(x)=x^3+8x^2+3x-8$:

Increasing Decreasing Positive Negative

5. Given $f(x) = x^4 - x^3 - 6x^2$, for what values of x will $f(x) > 0$?

1) $x < -2$, only
2) $x < -2$ or $x > 3$
3) $x < -2$ or $0 \le x \le 3$
4) $x > 3$, only

6. At which x value is the graph of $f(x) = 2x^3 - 11x^2 - 14x + 26$ *not* decreasing?

1) -.5
2) 3.9
3) 1.7
4) 4.3

7. The graph of $y = 2^x - 4$ is positive on which interval?

1) $(-\infty, \infty)$
2) $(2, \infty)$
3) $(0, \infty)$
4) $(-4, \infty)$

8. An estimate of the number of milligrams of a medication in the bloodstream t hours after 400 mg has been taken can be modeled by the function below.

$$I(t) = 0.5t^4 + 3.45t^3 - 96.65t^2 + 347.7t,$$

where $0 \le t \le 6$

Over what time interval does the amount of medication in the bloodstream strictly increase?

1) 0 to 2 hours
2) 0 to 3 hours
3) 2 to 6 hours
4) 3 to 6 hours

Name ___________________ Date ___________________

Mr. Schlansky Algebra II

Solving Systems Graphically Using TI

1. To the *nearest tenth*, the value of x that satisfies $2^x = -2x + 11$ is

1) 2.5
2) 2.6
3) 5.8
4) 5.9

2. For which values of x, rounded to the *nearest hundredth*, will $\left|x^2 - 9\right| - 3 = \log_3 x$?

1) 2.29 and 3.63
2) 2.37 and 3.54
3) 2.84 and 3.17
4) 2.92 and 3.06

3. For which approximate value(s) of x will $\log(x + 5) = |x - 1| - 3$?

1) 5, 1
2) −2.41, 0.41
3) −2.41, 5
4) 5, only

4. Which value, to the *nearest tenth*, is an approximate solution for the equation $f(x) = g(x)$, if $f(x) = \frac{5}{x - 3}$ and $g(x) = 2(1.3)^x$?

1) 3.2
2) 3.9
3) 4.0
4) 5.6

5. If $p(x) = 2\ln(x) - 1$ and $m(x) = \ln(x + 6)$, then what is the solution for $p(x) = m(x)$?

1) 1.65
2) 3.14
3) 5.62
4) no solution

6. Which value, to the *nearest tenth*, is *not* a solution of $p(x) = q(x)$ if $p(x) = x^3 + 3x^2 - 3x - 1$ and $q(x) = 3x + 8$?

1) −3.9
2) −1.1
3) 2.1
4) 4.7

7. If $f(x) = g(x)$ $f(x) = 3|x| - 1$ and $g(x) = 0.03x^3 - x + 1$, an approximate solution for the equation $f(x) = g(x)$ is

1) 1.96
2) 11.29
3) $(-0.99, 1.96)$
4) $(11.29, 32.87)$

8. Given: $h(x) = \frac{2}{9}x^3 + \frac{8}{9}x^2 - \frac{16}{13}x + 2$

$k(x) = -|0.7x| + 5$

State the solutions to the equation $h(x) = k(x)$, rounded to the *nearest hundredth.*

9. If $f(t) = 325e^{-.0735t} + 75$ and $g(t) = 375e^{-.0817t} + 75$, for what value of t does $f(t) = g(t)$ rounded to the *nearest tenth*?

10. A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where x is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer. To the *nearest integer*, solve the equation $A(x) = B(x)$.

11. Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating. An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. For what number of weekly visits will the two models provide the same rating?

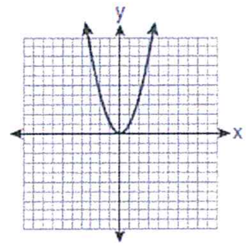
12. The value of a certain small passenger car based on its use in years is modeled by $V(t) = 28482.698(0.684)^t$, where $V(t)$ is the value in dollars and t is the time in years. Zach had to take out a loan to purchase the small passenger car. The function $Z(t) = 22151.327(0.778)^t$, where $Z(t)$ is measured in dollars, and t is the time in years, models the unpaid amount of Zach's loan over time. State when $V(t) = Z(t)$, to the *nearest hundredth.*

Name ____________ Date ________________

Mr. Schlansky Algebra II

Transforming Functions

1. The graph below represents $f(x)$.



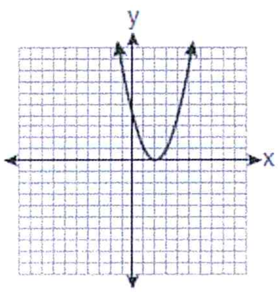
Match the following equations with their graphs:

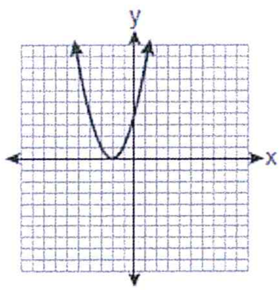
a) $f(x+2)$

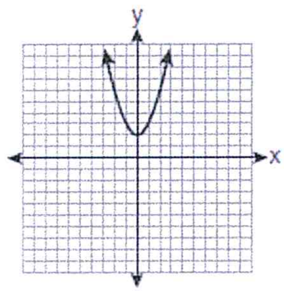
b) $f(x)+2$

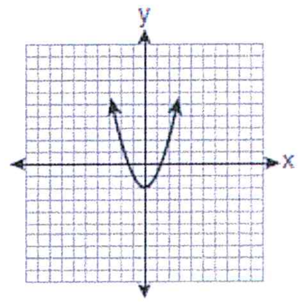
c) $f(x-2)$

d) $f(x)-2$

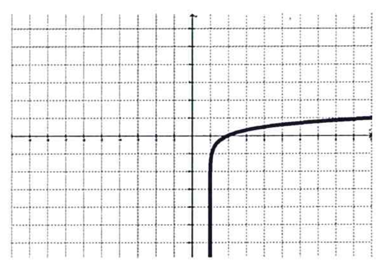








2. The graph below represents $f(x)$.



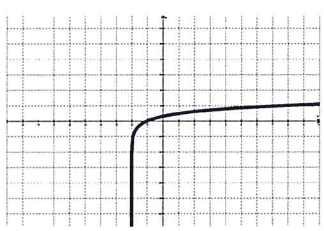
Match the following equations with their graphs:

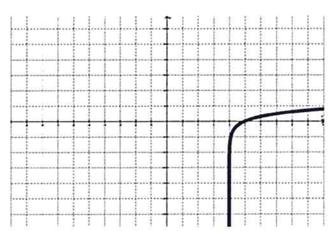
a) $f(x+2)$

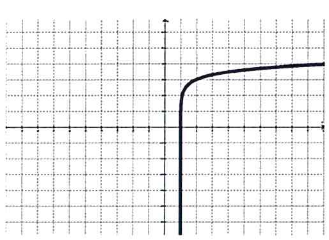
b) $f(x)+2$

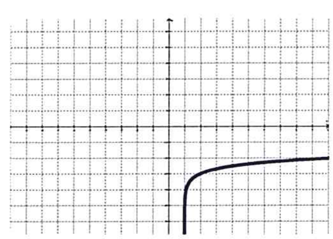
c) $f(x-2)$

d) $f(x)-2$









3. Which transformation of $y = 2^x$ results in the function $y = 2^x - 2$?

1) Up two units
2) Down two units
3) Right two units
4) Left 2 Units

4. Which transformation of $y = 2^x$ results in the function $y = 2^{x-2}$

1) Up two units
2) Down two units
3) Right two units
4) Left 2 Units

5. The function $f(x) = \sqrt{x}$. Which function represents a shift of the graph left 3 units?

1) $f(x-3) = \sqrt{x-3}$
2) $f(x+3) = \sqrt{x+3}$
3) $f(x)+3 = \sqrt{x}+3$
4) $f(x)-3 = \sqrt{x}-3$

6. Joey's math class is studying the basic quadratic function, $f(x) = x^2$. Each student is supposed to make two new functions by adding or subtracting a constant to the function. Joey chooses the functions $g(x) = x^2 - 5$ and $h(x) = x^2 + 2$. What transformations would map $f(x)$ to $g(x)$ and $f(x)$ to $h(x)$?

1) shift left 5, shift right 2
2) shift right 5, shift left 2
3) shift up 5, shift down 2
4) shift down 5, shift up 2

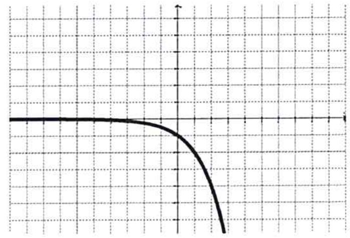
7. If $g(x) = f(x-4)+2$, how is the graph of $f(x)$ translated to form the graph of $g(x)$?

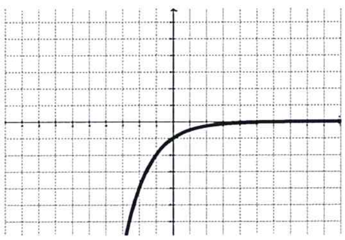
8. If $h(x) = f(x+1)-3$, how is the graph of $f(x)$ translated to form the graph of $g(x)$?

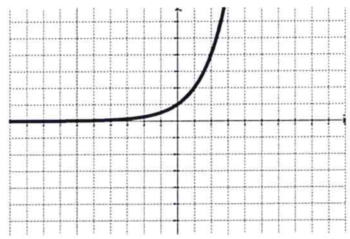
9. How is the parent function transformed to create $f(x) = |x+3| - 2$?

10. How is the parent function transformed to create $f(x) = (x-4)^2 + 3$?

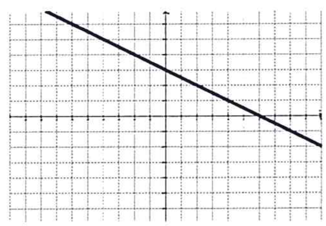
11. The graph to the right represents $f(x)$.
Match the following with their graphs:
a) Which graph represents $f(-x)$
b) Which graph represents $-f(x)$

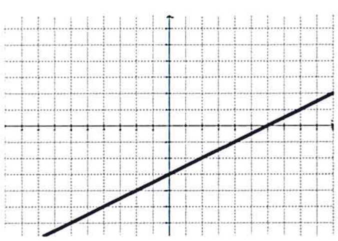


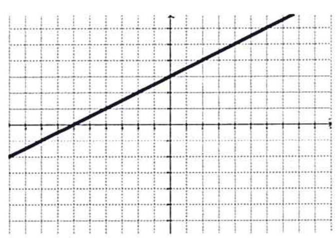




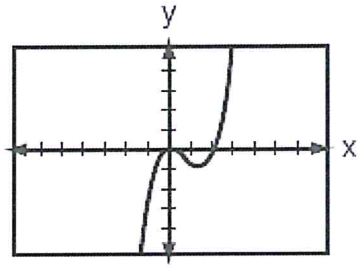
12. The graph to the right represents g(x).
Match the following with their graphs:
a) Which graph represents $g(-x)$
b) Which graph represents $-g(x)$



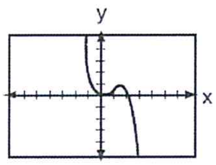




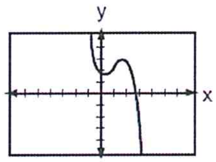
13. The accompanying graph represents the equation $y = f(x)$.



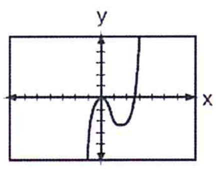
Which graph represents $g(x)$, if $g(x) = -f(x)$?



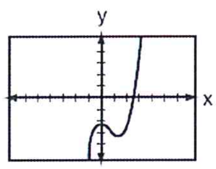
(1)



(3)

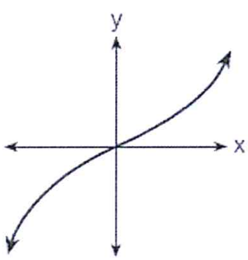


(2)

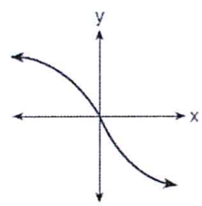


(4)

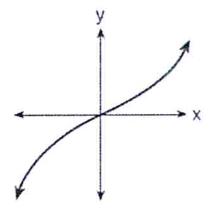
14. The graph below represents f(x).



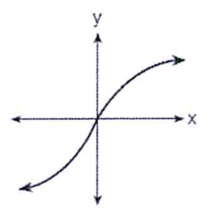
Which graph best represents f(-x)?



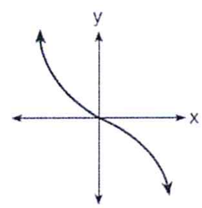
(1)



(3)

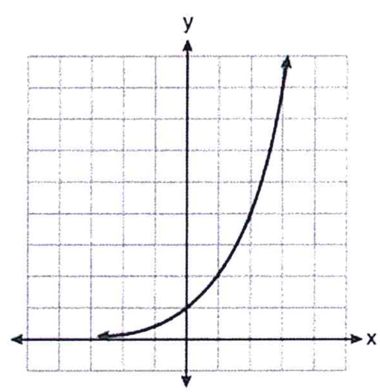


(2)



(4)

15. Consider the function $y = h(x)$, defined by the graph to the right.



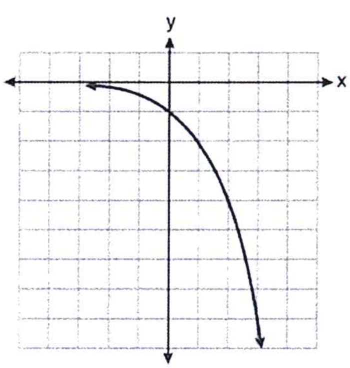
Which equation could be used to represent the graph shown below?

1) $y = h(x) - 2$

2) $y = h(x - 2)$

3) $y = -h(x)$

4) $y = h(-x)$



Name ______________ Date ________________
Mr. Schlansky Algebra II

Average Rate of Change

1. The function $h(x)$ is given in the table below. Which of the following gives its average rate of change over the interval $2 \leq x \leq 6$?

(1) $-\frac{3}{2}$

(2) $\frac{6}{4}$

(3) $-\frac{7}{6}$

(4) -1

x	$h(x)$
0	10
2	9
4	6
6	3

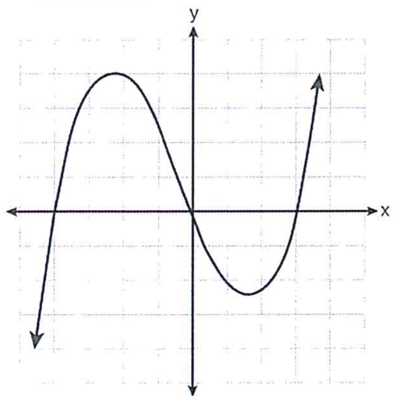
2. The distance needed to stop a car after applying the brakes varies directly with the square of the car's speed. The table below shows stopping distances for various speeds.
Determine the average rate of change in braking distance, in ft/mph, between one car traveling at 50 mph and one traveling at 70 mph.

Speed (mph)	10	20	30	40	50	60	70
Distance (ft)	6.25	25	56.25	100	156.25	225	306.25

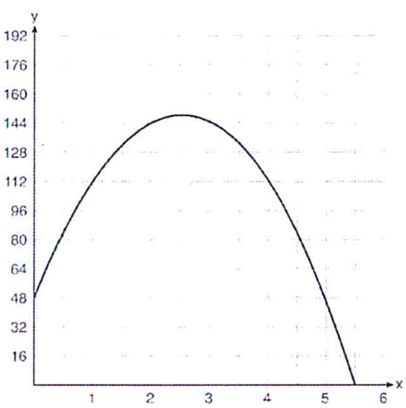
3. What is the average rate of change from 0 to 2?

x	f(x)
0	1
1	2
2	5
3	7

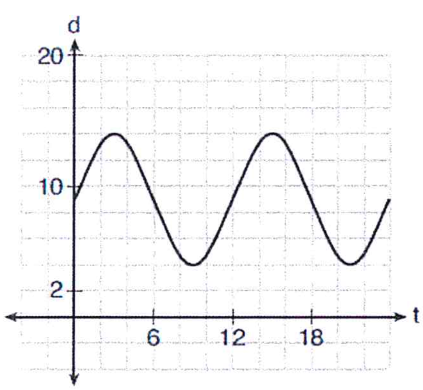
4. The graph of $p(x)$ is shown below. What is the average rate of change over the interval $-4 \le x \le 1$?



5. A ball is thrown into the air from the edge of a 48-foot-high cliff so that it eventually lands on the ground. The graph below shows the height, y, of the ball from the ground after x seconds. What is the average rate of change of the ball between 1 and 5 seconds?



6. The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below. If the depth, d, is measured in feet and time, t, is measured in hours since midnight, what is the average rate of change of the depth of the water between 3AM and 9AM?



7. For the function $f(x) = 3^x$, find the average rate of change over the interval -5 to -1 rounded to the nearest thousandth.

8. Find the average rate of change of the function $f(t) = 2500(0.97)^{4t}$ over the interval $10 \le t \le 15$ rounded to the nearest tenth.

9. An initial investment of $1000 reaches a value, $V(t)$, according to the model $V(t) = 1000(1.01)^{4t}$, where t is the time in years. Determine the average rate of change, to the *nearest dollar per year*, of this investment from year 2 to year 7.

Name ______________ Date ________________

Mr. Schlansky Algebra II

Average Rate of Change with Context

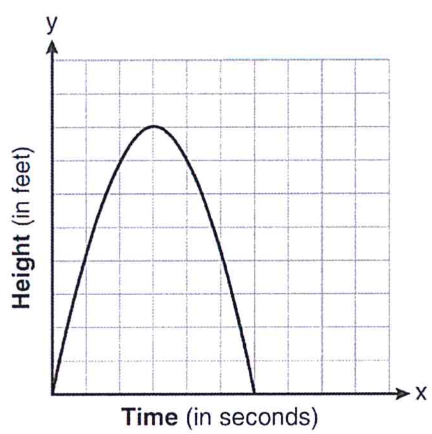
"On average, from x to x, the y topic is increasing/decreasing by AROC y units per x unit"

1. A family is traveling from their home to a vacation resort hotel. The table below shows their distance from home as a function of time.
Determine the average rate of change between hour 2 and hour 7. Explain its meaning in the given context.

Time (hrs)	0	2	5	7
Distance (mi)	0	140	375	480

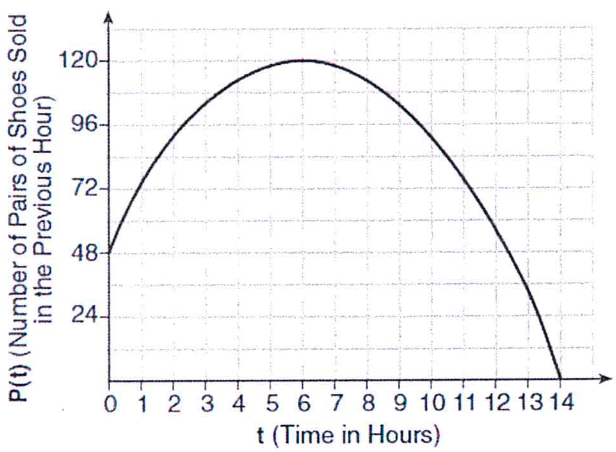
2. The average monthly high temperature in Buffalo, in degrees Fahrenheit, can be modeled by the function $B(t) = 25.29\sin(0.4895t - 1.9752) + 55.2877$, where t is the month number (January = 1). State, to the *nearest tenth*, the average monthly rate of temperature change between August and November. Explain its meaning in the given context.

3. The graph below represents the parabolic path of a ball kicked by a young child. Find the average rate of change from 3 to 6 seconds. Explain its meaning in the context of the problem.



4. The population, $P(t)$, of a town increased according to the function $P(t) = 12{,}000(1.03)^t$, where t is the number of years since 2000. Find the average rate of change from $t = 10$ to $t = 20$ rounding to the nearest integer. Explain its meaning in the context of the problem.

5. A manager wanted to analyze the online shoe sales for his business. He created a graph to model the data, as shown below. Determine the average rate of change between the sixth and fourteenth hours, and explain what it means in the context of the problem.



6. The table below shows the number of hours of daylight on the first day of each month in Rochester, NY. Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st? Interpret what this means in the context of the problem.

Month	Hours of Daylight
Jan.	9.4
Feb.	10.6
March	11.9
April	13.9
May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

Name _______________
Mr. Schlansky

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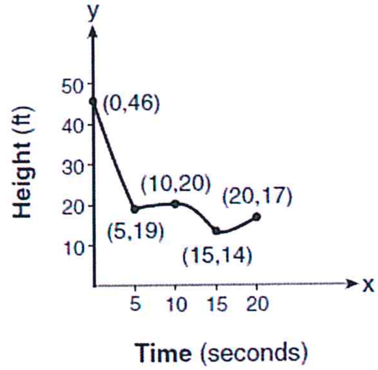
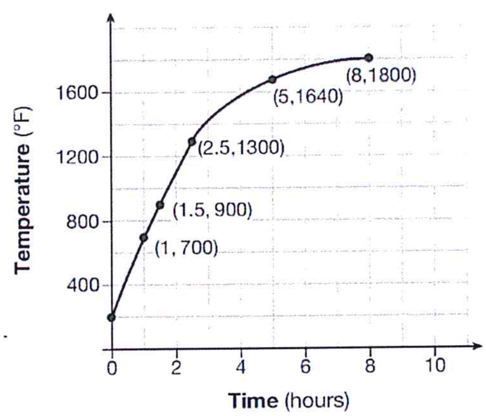
Algebra II

Average Rate of Change with Intervals

1. The graph below models the height of a remote-control helicopter over 20 seconds during flight.
Over which interval does the helicopter have the *fastest* average rate of change?
1) 0 to 5 seconds
2) 5 to 10 seconds
3) 10 to 15 seconds
4) 15 to 20 seconds

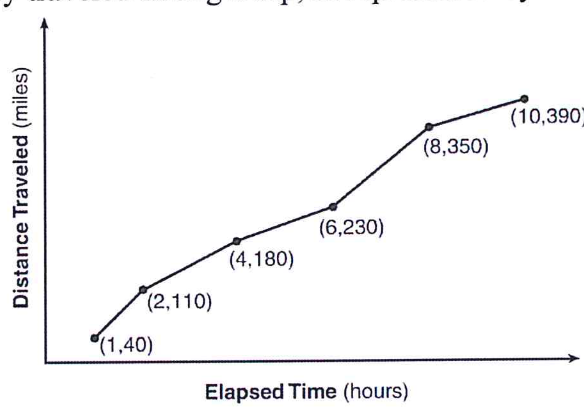


2. Firing a piece of pottery in a kiln takes place at different temperatures for different amounts of time. The graph below shows the temperatures in a kiln while firing a piece of pottery after the kiln is preheated to 200°F.
During which time interval did the temperature in the kiln show the greatest average rate of change?
1) 0 to 1 hour
2) 1 hour to 1.5 hours
3) 2.5 hours to 5 hours
4) 5 hours to 8 hours



3. The Jamison family kept a log of the distance they traveled during a trip, as represented by the graph below.

During which interval was their average speed the greatest?
1) the first hour to the second hour
2) the second hour to the fourth hour
3) the sixth hour to the eighth hour
4) the eighth hour to the tenth hour



4. The table below shows the year and the number of households in a building that had high-speed broadband internet access.

Number of Households	11	16	23	33	42	47
Year	2002	2003	2004	2005	2006	2007

For which interval of time was the average rate of change the *smallest*?
1) 2002 - 2004
2) 2003 - 2005
3) 2004 - 2006
4) 2005 - 2007

5. Joelle has a credit card that has a 19.2% annual interest rate compounded monthly. She owes a total balance of B dollars after m months. Assuming she makes no payments on her account, the table below illustrates the balance she owes after m months.

m	B
0	1000.00
10	1172.00
19	1352.00
36	1770.80
60	2591.90
69	2990.00
72	3135.80
73	3186.00

Over which interval of time is her average rate of change for the balance on her credit card account the greatest?
1) month 10 to month 60
2) month 19 to month 69
3) month 36 to month 72
4) month 60 to month 73

6. The function $N(t)=100(2.6)^{-0.023t}$ models the number of grams in a sample of cesium-137 that remain after t years. On which interval is the sample's average rate of decay the fastest?
1) $[1,10]$
2) $[10,20]$
3) $[15,25]$
4) $[1,30]$

Name ____________________ Date ____________________

Mr. Schlansky Algebra II

Finding the Inverse of a Function

1. What is the inverse of the function $y = 2x - 3$?

(1) $y = \frac{x+3}{2}$ (3) $y = -2x + 3$

(2) $y = \frac{x}{2} + 3$ (4) $y = \frac{1}{2x-3}$

2. If a function is defined by the equation y = 3x + 2, which equation defines the inverse of this function?

(1) $x = \frac{1}{3}y + \frac{1}{2}$ (3) $y = \frac{1}{3}x - \frac{2}{3}$

(2) $y = \frac{1}{3}x + \frac{1}{2}$ (4) y = -3x – 2

3. If $f(x) = 5x - 7$, find $f^{-1}(x)$

4. What is $g^{-1}(x)$ if $g(x) = 3x + 6$

5. What is the inverse of $y = \frac{1}{2}x + 2$?

6. If $f(x) = x^2$, find $f^{-1}(x)$

7. What is $h^{-1}(x)$ if $h(x) = x^2 + 2$

8. What is the inverse of the function $y = 4x + 5$?

1) $x = \frac{1}{4}y - \frac{5}{4}$

2) $y = \frac{1}{4}x - \frac{5}{4}$

3) $y = 4x - 5$

4) $y = \frac{1}{4x + 5}$

9. What is the inverse of $f(x) = -6(x - 2)$?

1) $f^{-1}(x) = -2 - \frac{x}{6}$

2) $f^{-1}(x) = 2 - \frac{x}{6}$

3) $f^{-1}(x) = \frac{1}{-6(x - 2)}$

4) $f^{-1}(x) = 6(x + 2)$

10. Given $f(x) = \frac{1}{2}x + 8$, which equation represents the inverse, $g(x)$?

1) $g(x) = 2x - 8$
2) $g(x) = 2x - 16$
3) $g(x) = -\frac{1}{2}x + 8$
4) $g(x) = -\frac{1}{2}x - 16$

11. The inverse of $f(x) = -6x + \frac{1}{2}$ is

1) $f^{-1}(x) = 6x - \frac{1}{2}$
2) $f^{-1}(x) = \frac{1}{-6x + \frac{1}{2}}$
3) $f^{-1}(x) = -\frac{1}{6}x + \frac{1}{12}$
4) $f^{-1}(x) = -\frac{1}{6}x + 2$

12. The inverse of the function $f(x) = \frac{x+1}{x-2}$ is

1) $f^{-1}(x) = \frac{x+1}{x+2}$
2) $f^{-1}(x) = \frac{2x+1}{x-1}$
3) $f^{-1}(x) = \frac{x+1}{x-2}$
4) $f^{-1}(x) = \frac{x-1}{x+1}$

13. What is the inverse of $f(x) = \frac{x}{x+2}$, where $x \neq -2$?

1) $f^{-1}(x) = \frac{2x}{x-1}$
2) $f^{-1}(x) = \frac{-2x}{x-1}$
3) $f^{-1}(x) = \frac{x}{x-2}$
4) $f^{-1}(x) = \frac{-x}{x-2}$

14. What is the inverse of $f(x) = x^3 - 2$?

1) $f^{-1}(x) = \sqrt[3]{x} + 2$
2) $f^{-1}(x) = \pm\sqrt[3]{x} + 2$
3) $f^{-1}(x) = \sqrt[3]{x+2}$
4) $f^{-1}(x) = \pm\sqrt[3]{x+2}$

Name ______________
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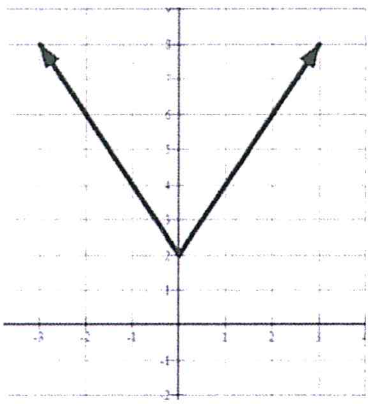
Algebra II

Even and Odd Functions

Determine graphically whether the following functions are even, odd, or neither

1.



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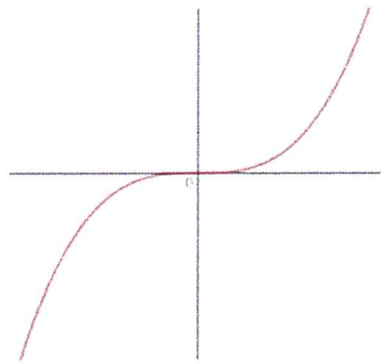

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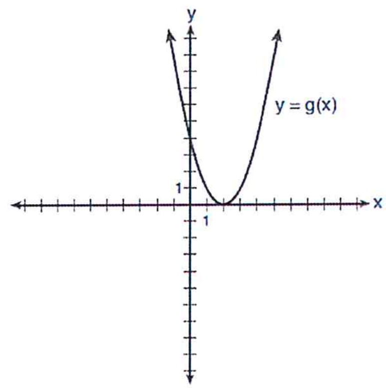

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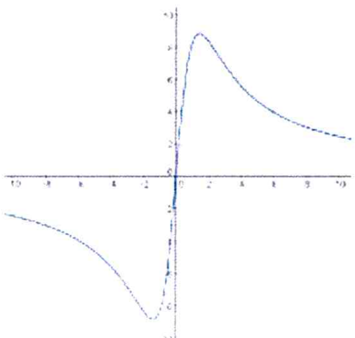

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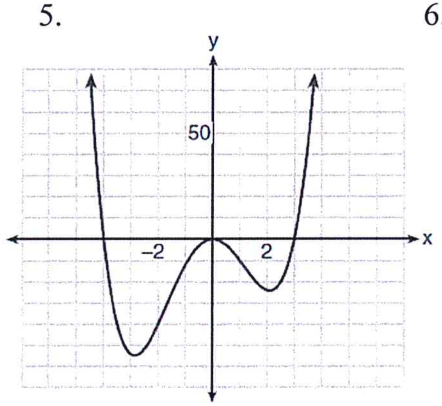

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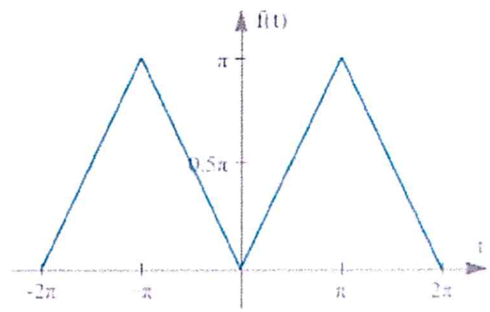

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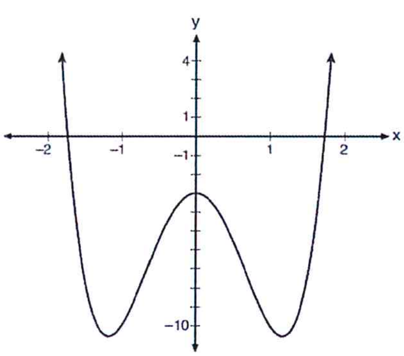

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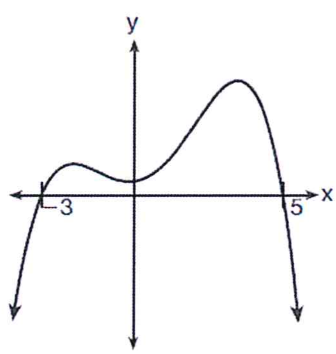

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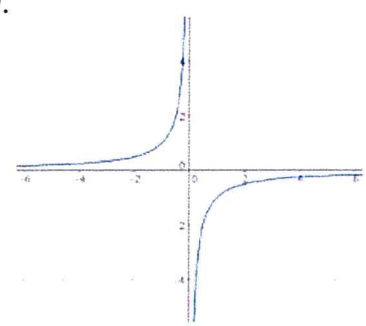
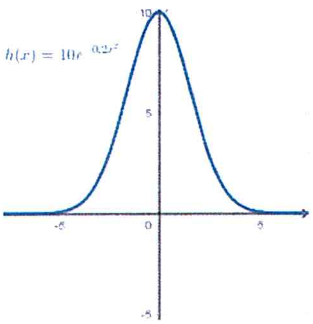
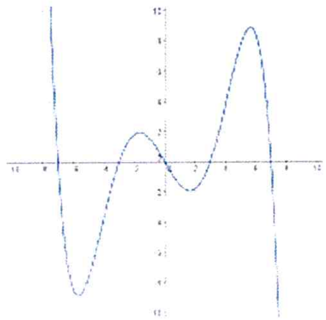
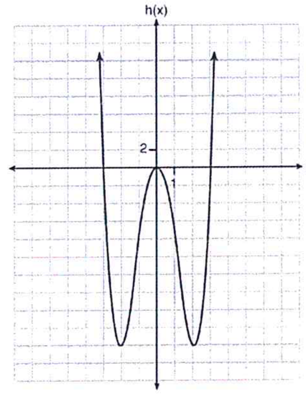
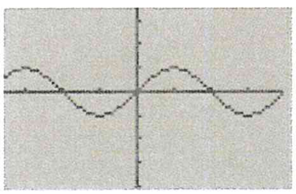
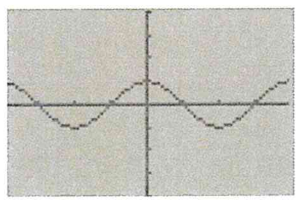


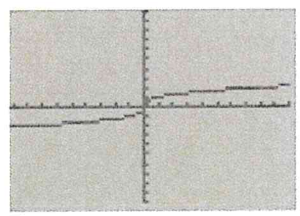
10. 

11. 

12. 

13. 

14. 

15. 

16. $f(x) = -x^4 + 4$

17. $f(x) = \frac{1}{2}x^5 - 2x$

18. $f(x) = 4x^3 - 6$

19. $f(x) = |x| + 4$

20. $f(x) = |x + 4|$

21. $f(x) = \frac{10}{x}$

22. $f(x) = x^3 + x$

23. $f(x) = -2x^4 + 8$

24. $f(x) = 2^{x+1}$

Name ______________ Date ________________

Mr. Schlansky Algebra II

Functions Review Sheet

1. The function $v(x) = x(3-x)(x+4)$ models the volume, in cubic inches, of a rectangular solid for $0 \le x \le 3$. To the *nearest tenth of a cubic inch*, what is the maximum volume of the rectangular solid?

2. A manufacturer of sweatshirts finds that profits and costs fluctuate depending on the number of products created. The manufacturer determines the profit, $p(x)$, in thousands of dollars, as a function of the number of sweatshirts sold, x, in thousands. This function, p, is given below. Over the interval $0 \le x \le 9$, state the maximum profit and round to the *nearest integer*.

$p(x) = -x^3 + 11x^2 - 7x - 69$

3. Over which intervals is the graph of $f(x) = -x^4 + 15x^2 - 7$ strictly decreasing?

1) $(-2.7, 0)$
2) $(-\infty, -2.5)$
3) $(2.5, \infty)$
4) $(-1.4, 1.2)$

4. Over which intervals is the graph of $f(x) = x^3 + 8x^2 + 3x - 8$ strictly decreasing?

1) $(-6, 0)$
2) $(-\infty, -6)$
3) $(-.2, \infty)$
4) $(-5.1, -.2)$

5. Which value, to the *nearest tenth*, is an approximate solution for the equation $f(x) = g(x)$, if $f(x) = \frac{5}{x-3}$ and $g(x) = 2(1.3)^x$?

1) 3.2
2) 3.9
3) 4.0
4) 5.6

6. If $p(x) = 2\ln(x) - 1$ and $m(x) = \ln(x+6)$, then what is the solution for $p(x) = m(x)$?

1) 1.65
2) 3.14
3) 5.62
4) no solution

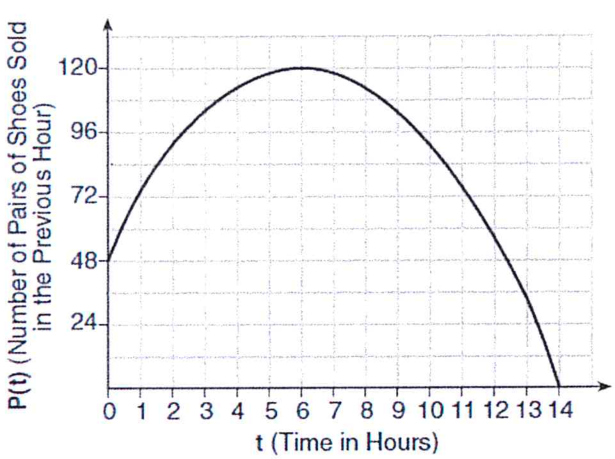
7. The function $f(x) = \sqrt{x}$. Which function represents a shift of the graph left 3 units and up 2 units?

1) $g(x) = \sqrt{x-3} - 2$
2) $g(x) = \sqrt{x+3} + 2$
3) $g(x) = \sqrt{x+2} - 3$
4) $g(x) = \sqrt{x-2} + 3$

8. Joey's math class is studying the basic quadratic function, $f(x) = x^2$. Each student is supposed to make two new functions by adding or subtracting a constant to the function. Joey chooses the function $g(x) = (x+2)^2 - 5$. What transformations would map $f(x)$ to $g(x)$?

1) shift left 2, shift down 5
2) shift right 2, shift down 5
3) shift right 5, shift up 2
4) shift left 5, shift down 2

9. A manager wanted to analyze the online shoe sales for his business. He created a graph to model the data, as shown below. Determine the average rate of change between the sixth and fourteenth hours, and explain what it means in the context of the problem.



10. The population, $P(t)$, of a town increased according to the function $P(t)=12{,}000(1.03)^t$, where t is the number of years since 2000. Find the average rate of change from $t=10$ to $t=20$ rounding to the nearest integer. Explain its meaning in the context of the problem.

11. The table below shows the number of hours of daylight on the first day of each month in Rochester, NY. Given the data, what is the average rate of change in hours of daylight per month from January 1st to April 1st? Interpret what this means in the context of the problem.

Month	**Hours of Daylight**
Jan.	9.4
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May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

12. Given $f(x)=\frac{1}{2}x+8$, which equation represents the inverse, $g(x)$?

1) $g(x)=2x-8$

2) $g(x)=2x-16$

3) $g(x)=-\frac{1}{2}x+8$

4) $g(x)=-\frac{1}{2}x-16$

13. The inverse of $f(x)=-6x+\frac{1}{2}$ is

1) $f^{-1}(x)=6x-\frac{1}{2}$

2) $f^{-1}(x)=\dfrac{1}{-6x+\frac{1}{2}}$

3) $f^{-1}(x)=-\frac{1}{6}x+\frac{1}{12}$

4) $f^{-1}(x)=-\frac{1}{6}x+2$

Determine whether the following are even functions, odd functions, or neither. Explain your answer.

14. $f(x) = \left(\frac{1}{2}\right)^x$

15. $f(x) = -x^2 + 4$

16. $f(x) = \frac{2}{x}$

17. $f(x) = -2x^3 + 6x$

18. $f(x) = -|x| - 6$

19. $f(x) = 2x^3 + 3$

20. The expression $(x+i)^2 - (x-i)^2$ is equivalent to

1) 0
2) $-2 + 4xi$
3) -2
4) $4xi$

21. The expression $6xi^3(-4xi + 5)$ is equivalent to

1) $2x - 5i$
2) $-24x^2 - 30xi$
3) $-24x^2 + 30x - i$
4) $26x - 24x^2 i - 5i$

22. Which value is *not* contained in the solution of the system shown below?

$4x - 5y + 2z = 130$

$3x + 2y - 7z = -99$

$10x - 6y - 4z = 112$

1) -8
2) -12
3) 10
4) 15

23. Which value is contained in the solution of the system shown below?

$3x + y + z = -4$

$x - 2y + z = -5$

$2x + 3y - 2z = -9$

1) -3
2) -4
3) -5
4) -9