VIDEOS KEY

Name _____ Date _____
Mr. Schlansky Algebra 2

Schlansky's Algebra 2 Guide to 65!

1. The expression $\frac{6x^3+17x^2+10x+2}{2x+3}$ equals

1) $3x^2+4x-1+\frac{5}{2x+3}$
2) $6x^2+8x-2+\frac{5}{2x+3}$
3) $6x^2-x+13-\frac{37}{2x+3}$
4) $3x^2+13x+\frac{49}{2}+\frac{151}{2x+3}$

Multiple Choice Strategy with Variables
If variables in the problems and answers:
10 STO → X, 15 STO → Y
Type in original problem, write down the value.
Type in each choice, write down the value.
If they match up, they are equivalent.
Check all four choices as more than one may be equivalent!

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

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

3. The expression $\sqrt[4]{16x^2y^7}$ is equivalent to

1) $2x^{\frac{1}{2}}y^{\frac{7}{4}}$
2) $2x^8y^{28}$
3) $4x^{\frac{1}{2}}y^{\frac{7}{4}}$
4) $4x^8y^{28}$

4. The solution set of the equation $\sqrt{x+3}=3-x$ is

1) $\{1\}$ 1→X 2=2 ✓
2) $\{0\}$
3) $\{1,6\}$ 6→X 3≠-3 X
4) $\{2,3\}$

Multiple Choice Strategy with Equations
-Store each potential answer (_____ STO → X)
-Type in left hand side, type in right hand side. If they match up, it is a solution.
*Be sure to check all potential answers as most equations have multiple answers

5. What is the solution set of the equation $\frac{30}{x^2-9}+1=\frac{5}{x-3}$?

1) $\{2,3\}$
2) $\{2\}$
3) $\{3\}$
4) $\{\ \}$

6. Which is the solution to: $2(3)^{4x}+1=11$?

1) $\frac{\log 5}{4\log 3}$
2) $\frac{4\log 5}{\log 3}$
3) $\frac{\log 3}{4\log 5}$
4) $\frac{4\log 3}{\log 5}$

7. What is the solution set for the equation $\sqrt{56-x} = x$?

$Y1 = \sqrt{56-x}$
$Y2 = x$
intersect

$x = 7$

Open Response Equations
1) Type in left hand side into Y1
2) Type in right hand side into Y2
3) Adjust window (if necessary)
4) 2nd Trace (Calc), 5: Intersect
5) The solution is the x value of the intersection

8. What is the solution set of the equation $\frac{30}{x^2-9} + 1 = \frac{5}{x-3}$?

9. Solve for x: $x^3 + x^2 = 4x + 4$

10. Is $x-6$ a factor of $p(x) = x^3 - 6x^2 + 4x - 1$? Explain your answer.

$P(6) = (6)^3 - 6(6)^2 + 4(6) - 1$
$P(6) = 23$
No, the remainder is not 0.

To determine if a binomial is a factor:
Find the remainder! (Use remainder theorem)
If the remainder is 0, it is a factor
If the remainder is not 0, it is not a factor

11. Is $x+2$ a factor of $p(x) = x^3 - 3x^2 - 8x + 4$? Explain your answer.

12. Determine if $x-5$ is a factor of $2x^3 - 4x^2 - 7x - 10$. Explain your answer.

13. Which binomial is a factor of $x^4 - 4x^2 - 4x + 8$?

1) $x-2$ $p(2)=0$ 3) $x-4$ $p(4)=184$

2) $x+2$ $p(-2)=16$ 4) $x+4$ $p(-4)=216$

To determine if a binomial is a factor:
Find the remainder! (Use remainder theorem)
If the remainder is 0, it is a factor
If the remainder is not 0, it is not a factor

14. Which binomial is *not* a factor of the expression $x^3 - 11x^2 + 16x + 84$?

1) $x+2$ 3) $x-6$

2) $x+4$ 4) $x-7$

15. Which binomial is *not* a factor of the expression $x^3 - 6x^2 - 49x - 66$?

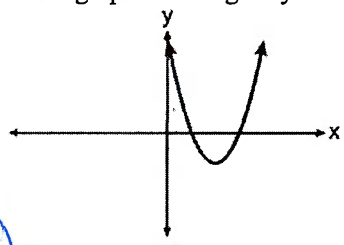
1) $x-11$ 3) $x+6$

2) $x+2$ 4) $x+3$

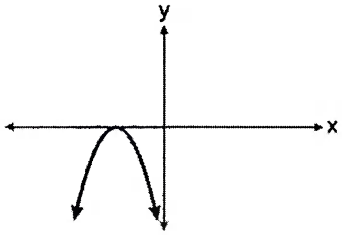
Imaginary Solutions
Imaginary solutions do not touch the x-axis

16. Which graph has imaginary roots?

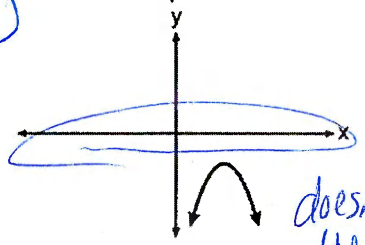
1)



3)

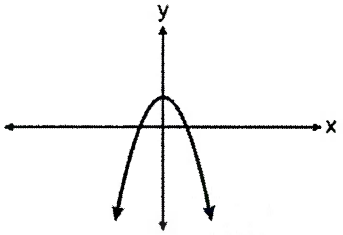


2)

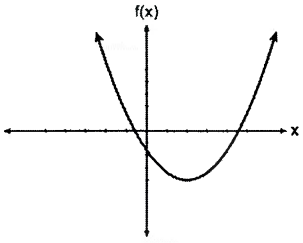


doesn't touch the x-axis

4)

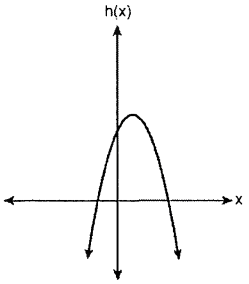


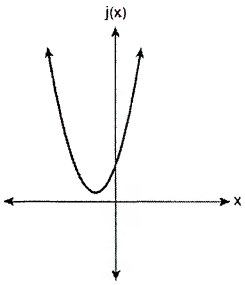
17. If $f(x)$ is represented by the graph below, Does $f(x)$ have imaginary roots? Explain your answer.



18. Which quadratic functions have imaginary roots?

1) $h(x)$ only
2) $j(x)$ only
3) Both $j(x)$ and $h(x)$
4) Neither $j(x)$ or $h(x)$

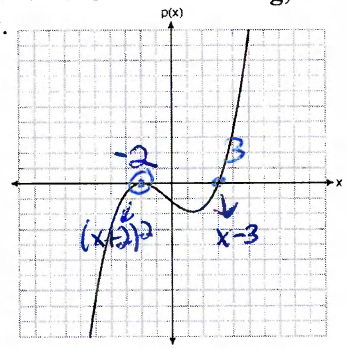




Writing Equations of Polynomial Functions
List the factors (change the sign of the zeros. Factors have an x).
*Don't forget y =
*Check if positive (opens up) or negative (opens down)
*Check for double roots (bounces off the x-axis)

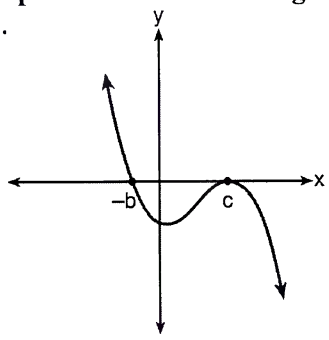
For each of the following, choose the equation that represents the attached graph.

19.



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

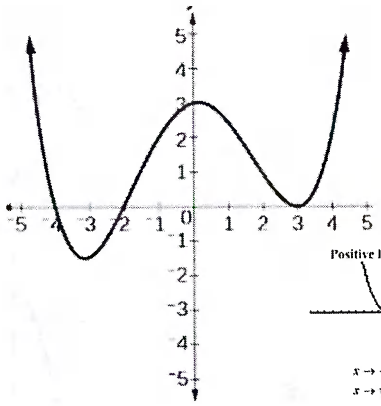
20.

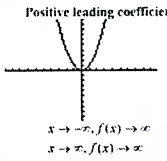


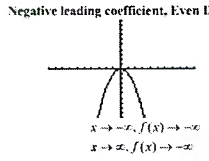
1) $y=-(x+b)^2(x-c)$
2) $y=-(x+b)(x-c)^2$
3) $y=-(x-b)^2(x+c)$
4) $y=-(x-b)(x+c)^2$

21.

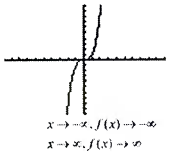
1) $y=(x-4)(x-2)(x+3)^2$
2) $y=(x+4)(x+2)(x-3)^2$
3) $y=(x+4)^2(x+2)^2(x-3)$
4) $y=(x-4)^2(x-2)^2(x+3)$



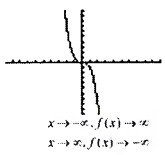




Positive leading coefficient, Odd Degree



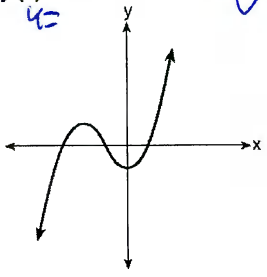
Negative leading coefficient, Odd Degree



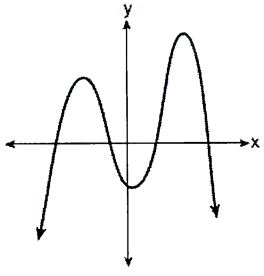
22. Consider the end behavior description below.

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

1) $f(x)=x^4+2x^2+1$
2)



3) $f(x)=-x^3+2x-6$
4)

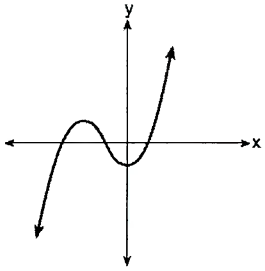


23. Consider the end behavior description below.

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

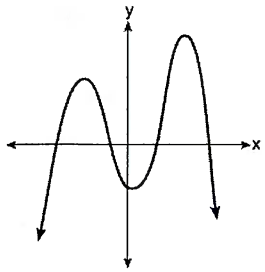
1) $f(x) = x^4 + 2x^2 + 1$

2)



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

4)



24. Consider the end behavior description below.

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

Which function satisfies the given conditions?

1) $f(x) = -x^4 + 3x^3 + 2x^2 - 1$
2) $f(x) = 2x^3 - 7x + 5$
3) $f(x) = -7x^5 + 5x^4 + 8x^2 - 6$
4) $f(x) = -8x^7 + 5x^5 - 11x^2 + 2x - 7$

Solving 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.**

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

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

$y1 = |x^2 - 9| - 3$ intersect
$y2 = \log_3 x$
x values only!

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

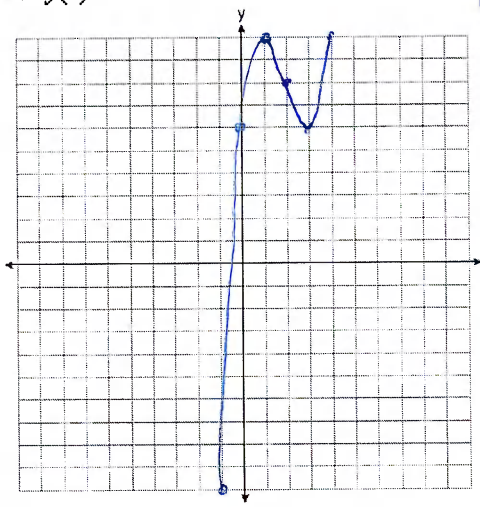
1) 5, 1
2) −2.41, 0.41
3) −2.41, 5
4) 5, only

27. 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

Graph the following on the given domain (if necessary)

28. $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \le x \le 4$.



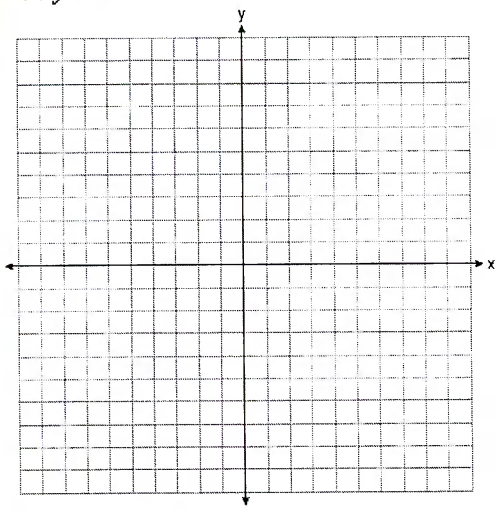
no arrows

x	y
-1	-10
0	6
1	10
2	8
3	6
4	10

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

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

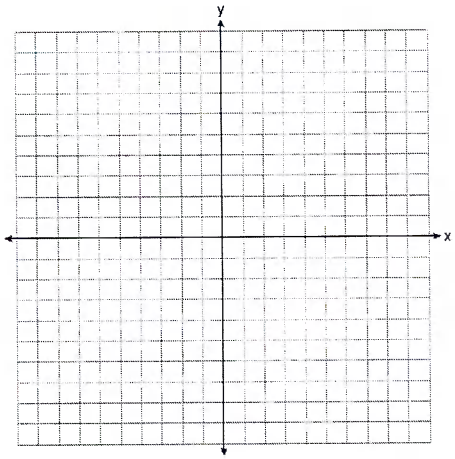
29. $y = x^3 - 4x^2 + 2x + 7$



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

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

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



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

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

Graphing Polynomial Functions

1) Type equation into $Y =$
2) 2nd Graph (Table)
   *Plot points in given domain or that fit on the given graph

- Domain: no arrows. No domain: arrows.

Exponential: $y =$ *vertical shift* or y value that is repeated in the table

Logarithmic: $x =$ *horizontal shift* or the x value that contains the last error

Graph the following equations (Include domain and asymptotes if necessary)

Inverse of a function $f^{-1}(x)$ Algebraically:

Switch x and y, solve for y

*If multiple choice:

-type original function into Y = and write down three nice points.

-switch x and y

-type all four choices into Y1, Y2, Y3, and Y4 and see which table matches.

31. What is the inverse of the function $y = 4x + 5$? switch x and y

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

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

$x = 4y + 5$

$-5 \quad -5$

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

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

3) $y = 4x - 5$

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

(or)

x	y
-2	-3
-1	1
0	5

→

x	y
-3	-2
1	-1
5	0

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

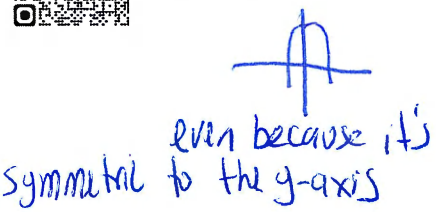
33. Given $f(x) = \frac{1}{2}x + 8$, which equation represents the inverse, $g(x)$?

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

Even and Odd Functions
Even Functions are symmetric to the y-axis
Odd Functions are symmetric to the origin (turn the paper upside down)

Are the following functions even, odd, or neither? Explain your answer.

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



even because it's symmetric to the y-axis

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

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

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

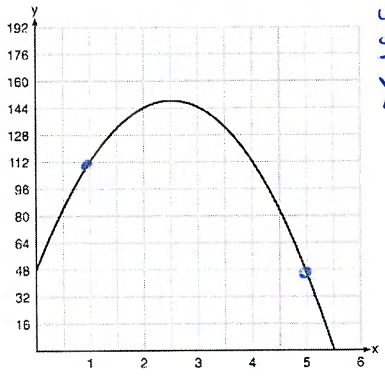
right 4 up 2

Transforming Functions
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

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

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

40. 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?



$\frac{y_2-y_1}{x_2-x_1}$

x	y
1	112
5	48

$\frac{48-112}{5-1}$

-16

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

Always create a table!
1) If given table, circle values in the table.
2) If given a graph, pull y values from the graph.
3) If given an equation, type into y= and pull the values from the table.

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

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

42. 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.

Radicals are fractional exponents (Fractional exponent = $\frac{power}{root}$)

*Add exponents when multiplying. Subtract exponents when dividing. Use a calculator for fractions.

Express the following in simplest form with the

43. $\sqrt[4]{x^3}\cdot\sqrt[2]{x^5}$

$x^{\frac{3}{4}}\cdot x^{\frac{5}{2}}$

$\frac{3}{4}+\frac{5}{2}=\frac{13}{4}$ $x^{\frac{13}{4}}$

44. $\sqrt[3]{b^5}\cdot\sqrt[4]{b}$

45. $\frac{\sqrt[6]{x^5}}{\sqrt[3]{x^2}}$

Graphing Exponential and Logarithmic Functions

1) Type into y = and plot the points
2) Asymptote of exponential is y = vertical shift OR repeated value in the table
   Asymptote of logarithmic is x = horizontal shift OR the last error in the table

For the following equations, graph the equation and the asymptote. State the domain, range, equation of the asymptote, and end behavior.

46. $y = 2^x - 3$

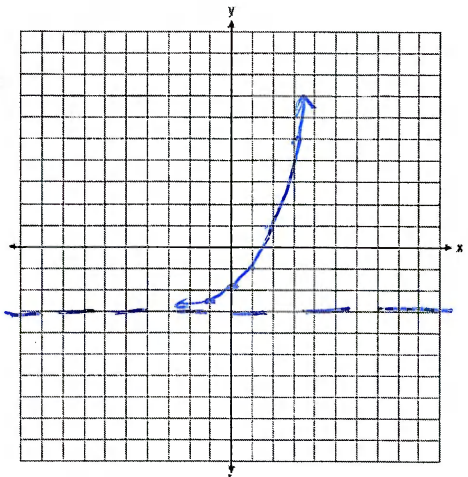
Asymptote: $y = -3$

x	y
-3	-2.75
-2	-2.5
-1	-2
0	-1
1	1
2	5
3	13

End Behavior:

$x \to -\infty,\ f(x) \to -3$

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



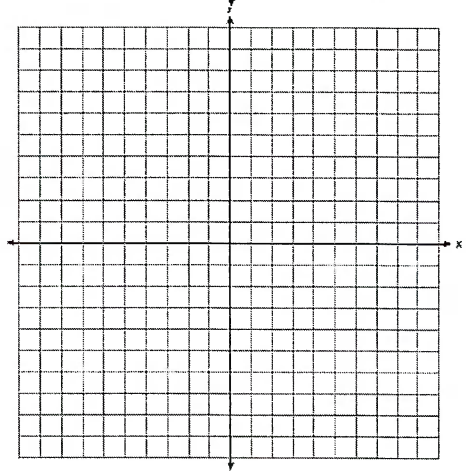
47. $y = \left(\frac{1}{2}\right)^{x-3} + 1$

Asymptote:

End Behavior:

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

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



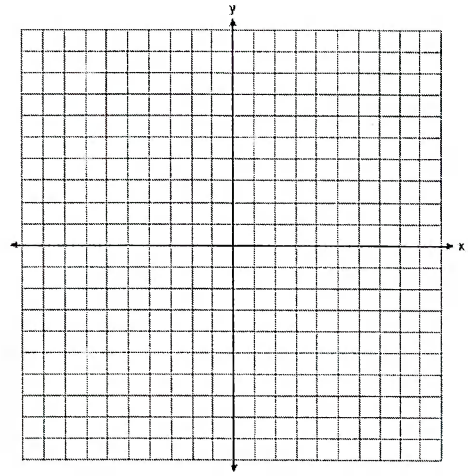
48. $y = -3^{x-2} + 4$

Asymptote:

End Behavior:

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

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



Graphing Exponential and Logarithmic Functions

1) Type into y = and plot the points
2) Asymptote of exponential is y = vertical shift OR repeated value in the table
   Asymptote of logarithmic is x = horizontal shift OR the last error in the table

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

x	y
3	ERROR
4	1
5	-3
7	-7

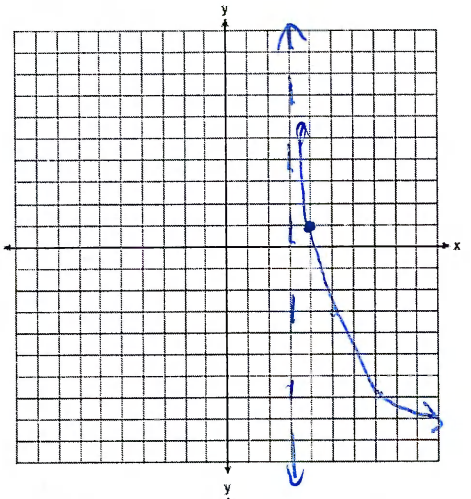
Asymptote:

$x=3$

End Behavior:

$x \to 3,\ f(x) \to$ ∞

$x \to \infty,\ f(x) \to$ -∞



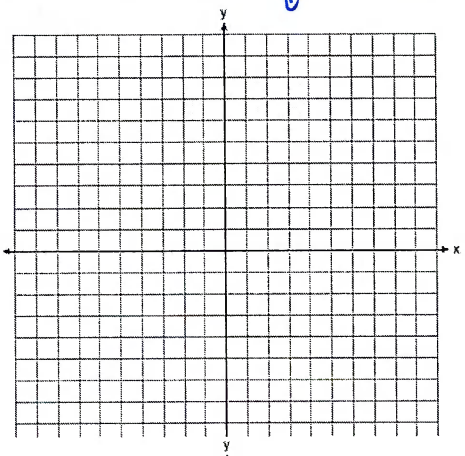
50. $y=3\log_4(x+1)-8$

Asymptote:

End Behavior:

$x \to -1,\ f(x) \to$

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



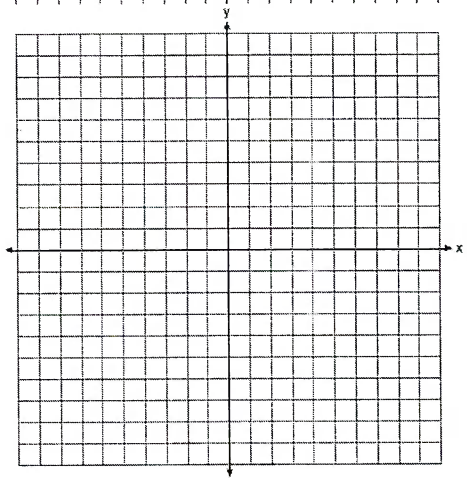
51. $y=-4\log_2(x+9)+4$

Asymptote:

End Behavior:

$x \to -9,\ f(x) \to$

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



Regression Equations

1) Stat, Edit
2) Input x column into L1 and y column into L2
3) Stat, Calc, 0: ExpReg or 5: QuadReg or A: PwrReg
4) READ AND ROUND CAREFULLY

*Use logs or Y1 Y2 Intersect to find x given y.

52. The table below gives air pressures in kPa at selected altitudes above sea level measured in kilometers.

x	**Altitude** (km)	0	1	2	3	4	5
y	**Air Pressure** (kPa)	101	90	79	70	62	54

ExpReg

Write an exponential regression equation that models these data rounding all values to the *nearest thousandth*. Use this equation to determine the altitude, to the *nearest hundredth* of a kilometer, when the air pressure is 29 kPa.

$y = a(b)^x$

$y = 101.523(.883)^x$

$29 = 101.523(.883)^x$

$\frac{29}{101.523} = \frac{101.523(.883)^x}{101.523}$

$\log .2856.. = \log .883^x$

$\frac{\log .2856..}{\log .883} = \frac{x \log .883}{\log .883}$

$10.07 = x$

y

$y_1 = 29$

$y_2 = 101.523(.883)^x$

intersect

$x = 10.07$

53. Using a microscope, a researcher observed and recorded the number of bacteria spores on a large sample of uniformly sized pieces of meat kept at room temperature. A summary of the data she recorded is shown in the table below.

Hours (x)	**Average Number of Spores** (y)
0	4
0.5	10
1	15
2	60
3	260
4	1130
6	16,380

Using these data, write an exponential regression equation, rounding all values to the *nearest thousandth*. The researcher knows that people are likely to suffer from food-borne illness if the number of spores exceeds 100. Using the exponential regression equation, determine the maximum amount of time, to the *nearest hundredth*, that the meat can be kept at room temperature safely.

54. A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
F(t)	180	144	120	104	93.3	86.2

Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*. After how much time will the temperature of the coffee be 67 degrees, rounded to the *nearest minute*?

55. The stopping distances for Jim's car while driving at various speeds are shown in the table below.

x	**Speed** (mph)	10	15	20	25	30	40
y	**Stopping Distance** (ft)	12	22	39	58	84	150

Based on these data, find the power regression equation for the set of data. Round all coefficients to the *nearest hundredth*.

$y = a(x)^b$

$y = .16(x)^{1.83}$

Regression Equations

1) Stat, Edit
2) Input x column into L1 and y column into L2
3) Stat, Calc, 0: ExpReg or 5: QuadReg or A: PwrReg
4) READ AND ROUND CAREFULLY

*Use logs or Y1 Y2 Intersect to find x given y.

Jim is driving along a main street in his town and sees traffic building up ahead and needs to stop. Use the equation to find the distance needed for Jim's car to stop if it is traveling at a speed of 55 mph, rounded to the *nearest foot*.

x

$y = .16(55)^{1.83}$

$y = 245$

If Jim's car needs 100 feet of stopping distance, determine how fast Jim is driving, to the *nearest mile per hour*.

y

$100 = .16(x)^{1.83}$

$x = 34$

$y_1 = 100$

$y_2 = .16x^{1.83}$

intersect

Regression Equations

1) Stat, Edit
2) Input x column into L1 and y column into L2
3) Stat, Calc, 0: ExpReg or 5: QuadReg or A: PwrReg
4) READ AND ROUND CAREFULLY

*Use logs or Y1 Y2 Intersect to find x given y.

56. The concentration, y, in milligrams per liter, of a medication in a patient's bloodstream x hours after taking the medication is listed for specified values in the table below.

Write the equation of the quadratic regression that models these data, rounding all values to the *nearest tenth*.

$y=ax^2+bx+c$

$y=-56.2x^2+139.3x+9.4$

Time (hours) (x)	**Concentration** (mg/l) (y)
0	0
0.5	78.1
1	99.8
1.5	84.4
2	50.1
2.5	15.6

Based on your regression equation from above, determine the concentration in the patient's bloodstream 1.75 hours after the medication was taken, rounded to the *nearest tenth of a milligram per liter*. Determine to the *nearest tenth of an hour*, the number of hours after taking the medication it would take for the concentration to be 35 milligrams per liter.

$y=-56.2(1.75)^2+139.3(1.75)+9.4$

$y=81.1$

$35=-56.2x^2+139.3x+9.4$

$x=.2$

$x=2.3$

57. Water is draining from a tank maintained by the Yorkville Fire Department. Students measured the depth of the water in 15-second intervals and recorded the results in the accompanying table.

Write the power regression equation for this set of data, rounding all values to the *nearest ten-thousandth*.

Time (x) (in seconds)	**Depth of Water** (y) (in feet)
15	11.8
30	9.9
45	8.2
60	6.3
75	5.9

Using this equation, predict the depth of the water at 120 seconds, to the *nearest tenth of a foot*. Using this equation, find the number of seconds it will take for the tank to have only 3 feet of water remaining. Round your answer to the *nearest second*.

58. The following data table shows a car's speed in miles per hour and the car's fuel efficiency in miles per gallon for each speed.
Write the quadratic regression equation for these data, rounding all coefficients to the *nearest thousandth*.

Speed (mph)	**Fuel Efficiency** (mpg)
18.6	26.1
24.9	29.4
31.1	31.4
37.3	33.1
43.5	33.2
49.7	31.4
55.9	29.5
62.1	26.0

Use the equation to determine, to the *nearest mile per gallon*, the fuel efficiency of the car when it is driven at a speed of 70 miles per hour. Using the equation above, algebraically determine, to the *nearest tenth of a mile per hour*, the fastest speed the car can be driven so that its fuel efficiency is 30 miles per gallon.

59. A recursive formula for the sequence 18, 9, 4.5, . . . is

1) $g_1 = 18$

$g_n = \frac{1}{2} g_{n-1}$

2) $g_n = 18\left(\frac{1}{2}\right)^{n-1}$

3) $g_1 = 18$

$g_n = 2g_{n-1}$

4) $g_n = 18(2)^{n-1}$

$\frac{9}{18} = \frac{1}{2}$

$\frac{4.5}{9} = \frac{1}{2}$

Recursive Formula

$a_1 =$

$a_n = a_{n-1}$

$a_1 = 18$

$a_n = \frac{1}{2} a_{n-1}$

60. A recursive formula for the sequence 40, 30, 22.5, . . . is

1) $g_n = 40\left(\frac{3}{4}\right)^n$

2) $g_1 = 40$

$g_n = g_{n-1} - 10$

3) $g_n = 40\left(\frac{3}{4}\right)^{n-1}$

4) $g_1 = 40$

$g_n = \frac{3}{4} g_{n-1}$

61. A recursive formula for the sequence 64, 48, 36, . . . is

1) $a_n = 64(0.75)^{n-1}$

2) $a_1 = 64$

$a_n = a_{n-1} - 16$

3) $a_n = 64 + (n-1)(-16)$

4) $a_1 = 64$

$a_n = 0.75a_{n-1}$

62. Write a recursive formula for the sequence 6, 9, 13.5, 20.25, . . .

$a_1 = 6$

$a_n = 1.5a_{n-1}$

$\frac{9}{6} = 1.5$

$\frac{13.5}{9} = 1.5$

Recursive Formula

$a_1 =$

$a_n = a_{n-1}$

63. Write a recursive formula for the sequence 189, 63, 21, 7, ...

64. Write a recursive formula for the sequence 20, 35, 61.25

65. Find the 4th term of the recursive sequence $a_1 = -3$, $a_n = 4 - 3a_{n-1}$

$a_2 = 4 - 3(-3)$ $a_2 = 13$

$a_3 = 4 - 3(13)$ $a_3 = -35$

$a_4 = 4 - 3(-35)$ $a_4 = 109$

Evaluating Recursive Sequences

a_{n-1} means the previous term!

1) Start with the term after the one they give you
2) Substitute the previous term in for a_{n-1}

66. If $a_n = 3a_{n-1} - 4$ and $a_2 = 9$, find a_5

67. Find the 8th term for the sequence where $a_n = 5a_{n-1} + 2$ where $a_5 = 3$

68. Rowan is training to run in a race. He runs 15 miles in the first week, and each week following, he runs 3% more than the week before. Using a geometric series formula, find the total number of miles Rowan runs over the first ten weeks of training, rounded to the *nearest thousandth*.

1.03 a_1 S_n n

$n = 10$
$a_1 = 15$
$r = 1.03$

$S_n = \frac{a_1(1-r^n)}{1-r}$

$S_{10} = \frac{15(1-1.03^{10})}{1-1.03}$

$S_{10} = 171.958$

Series
Formulas are on Reference Sheet!

To write a geometric series (percents): $S_n = \frac{a_1(1-r^n)}{1-r}$

Increasing by 5%: r = 1.05
Decreasing by 5%: r = .95

69. A 7-year lease for office space states that the annual rent is $85,000 for the first year and will increase by 6% each additional year of the lease. What will the total rent expense be for the entire 7-year lease?

70. A fisherman harvests 350 kilograms of crab on Monday. From Monday to Friday, the fisherman harvests 8% less kilograms of crab per day. To the *nearest tenth of a kilogram*, what is the total amount of crab harvested between Monday and Friday?

71. Jim is looking to buy a vacation home for $172,600 near his favorite southern beach. The formula to compute a mortgage payment, M, is $M = P \bullet \frac{r(1+r)^N}{(1+r)^N - 1}$ where P is the principal amount of the loan, r is the monthly interest rate, and N is the number of monthly payments. Jim's bank offers a monthly interest rate of 0.305% for a 15-year mortgage. With a $20,000 down payment, determine Jim's mortgage payment, rounded to the *nearest dollar*.

Mortgage/Annuities
The formulas will be given to you for each problem!
Amount of loan (P) = total cost – down payment
Number of monthly payments (n) = 12(# of years)

$M = M$
$P = 172{,}600 - 20{,}000 = 152{,}600$
$r = .00305$
$n = 12(15) = 180$

$M = 152{,}600 \cdot \frac{.00305(1+.00305)^{180}}{(1+.00305)^{180} - 1}$

$M = \$1103$

72. Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed
n = number of monthly pay periods
PMT = monthly payment
i = interest rate per month

73. Monthly mortgage payments can be found using the formula below:

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^n}{\left(1+\frac{r}{12}\right)^n - 1}$$

M = monthly payment
P = amount borrowed
r = annual interest rate
n = number of monthly payments

The Banks family would like to purchase a home for $220,000. They qualified for an annual interest rate of 4.8%. If they put make a down payment of $100,000 and plan to spend 15 years to repay the loan, what will be the monthly payment rounded to the *nearest* cent?

Evaluating Special Angles
If multiple choice, type the problem in, type in each answer, see what matches up.

74. What is the exact value of $\tan\left(\frac{3\pi}{4}\right)$? $= -1$

1) 1
2) -1
3) $\sqrt{3}$
4) $-\sqrt{3}$

75. What is the exact value of $\cos\left(-\frac{5\pi}{6}\right)$?

1) $\frac{\sqrt{3}}{2}$
2) $\frac{1}{2}$
3) $-\frac{\sqrt{3}}{2}$
4) $-\frac{\sqrt{2}}{2}$

76. The exact value of $\sin\left(\frac{8\pi}{3}\right)$ is

1) $\frac{1}{2}$
2) $-\frac{1}{2}$
3) $-\frac{\sqrt{3}}{2}$
4) $\frac{\sqrt{3}}{2}$

77. Given: A = {2, 3, 5, 6, 8, 11, 15, 17, 19}
B = {4, 5, 6, 9, 15, 18}

Sets: (Intersection, Union, and Complement)
Intersection($\cap$) is both (List everything in both (all) sets) $\cap$
Union($\cup$) is all together (List everything that you see in either one. List once if it appears twice)
Complement is everything else (Cross out what is in the subset and list everything else)

a) What is $A \cap B$?

Intersection is both

{5,6,15}

b) What is $A \cup B$?

Union is all together

{2,3,4,5,6,8,9,11,15,17,18,19}

78. Given: A = {11, 14, 16, 21, 27, 33, 35}
B = {4, 8, 12, 16}

a) What is $A \cap B$?

b) What is $A \cup B$?

79. Given: A = {2, 4, 8, 11, 12, 17, 23}
B = {4, 5, 15, 24}

a) What is $A \cap B$?

b) What is $A \cup B$?

Sets: (Intersection, Union, and Complement)
Intersection($\cap$) is both (List everything in both (all) sets) $\cap$
Union($\cup$) is all together (List everything that you see in either one. List once if it appears twice)
Complement is everything else (Cross out what is in the subset and list everything else)

80. Given: Set U = {S, O, P, H, I, A}
Set B = {A, I, O}
everything else
If set B is a subset of set U, what is the complement of set B?
1) {O, P, S}
2) {I, P, S}
3) {A, H, P}
4) {H, P, S}

81. Given: U = {1, 2, 3, 4, 5, 6, 7, 8}
B = {2, 3, 5, 6}
Set B is a subset of set U. What is the complement of set B?
1) { }
2) {2, 3, 5, 6}
3) {1, 4, 7, 8}
4) {1, 2, 3, 4, 5, 6, 7, 8}

82. If the universal set is {pennies, nickels, dimes, quarters}, what is the complement of the set {nickels}?

1) { }
2) {pennies, quarters}
3) {pennies, dimes, quarters}
4) {pennies, nickels, dimes, quarters}

83. The probability that a student in Jacqua High School is in band is $\frac{127}{466}$ and the probability that a student is on the track team is $\frac{82}{466}$. If the probability that they are on the track team and in band is $\frac{74}{466}$, what is the probability that they are on the track team or in band?

Probability with ∩ (and) and ∪ (or)
Or: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
And: $P(A \cap B) = P(A) + P(B) - P(A \cup B)$
And (Independent) $P(A \cap B) = P(A) \bullet P(B)$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cup B) = \frac{127}{466} + \frac{82}{466} - \frac{74}{466}$

$\frac{135}{466}$

84. The probability that a person files their tax return in March is $\frac{127}{165}$. The probability that a person watches College Basketball in March is $\frac{98}{123}$. If the probability that a person watches College Basketball and files their tax return in March is $\frac{62}{95}$, what is the probability that a person watches College Basketball or files their tax return? Round your answer to the nearest percent.

85. On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?

1) 73%
2) 36%
3) 23%
4) 12%

Probability with Two Way Tables

2 Things "and" 1	1 Thing 2	2 Things "given" 3	2 Things No key words 4
$\frac{\text{total}}{\text{total}}$	$\frac{\text{total}}{\text{total}}$	$\frac{\text{condition (last)}}{\text{condition (first)}}$	$\frac{\text{condition (first)}}{\text{condition (last)}}$

86. One-hundred employees of a company were asked their opinion on paying high salaries to the CEO. Their responses are summarized in the following contingency table. Express the following probabilities as fractions and rounded to the nearest percent.

	In Favor	Against	
Male	15	45	60
Female	4	36	40
	19	81	100

1 a) Find the probability that they are male and in favor

$\frac{15}{100}$

2 b) Find the probability that they are female

$\frac{40}{100}$

4 c) Find the probability that a male is in favor

$\frac{15}{60}$

3 d) Find the probability that they are against given that they are female

$\frac{36}{40}$

4 e) Find the probability that someone is in favor is a male

$\frac{15}{19}$

1 f) Find the probability that someone is female and against

$\frac{36}{100}$

4 g) Find the probability that a female is in favor

$\frac{4}{40}$

3 h) Find the probability that someone is male given that they are in favor

$\frac{15}{19}$

87. A middle school conducted a survey of students to determine if they spent more of their time playing games or watching videos on their tablets. The results are shown in the table below.

	Playing Games	Watching Videos	Total
Boys	138	46	184
Girls	54	142	196
Total	192	188	380

Of the students who spent more time playing games on their tablets, approximately what percent were boys?

1) 41
2) 56
3) 72
4) 75

88. A survey was given to 12th-grade students of West High School to determine the location for the senior class trip. The results are shown in the table below.

	Niagara Falls	Darien Lake	New York City
Boys	56	74	103
Girls	71	92	88

To the *nearest percent*, what percent of the boys chose Niagara Falls?

1) 12
2) 24
3) 44
4) 56

89. One-hundred employees of a company were asked their opinion on paying high salaries to the CEO. Their responses are summarized in the following contingency table.

	In Favor	Against
Male	15	45
Female	4	36

Based on the data, are gender an opinion on salaries independent of each other? Justify your answer.

Independence
If events are independent:
$P(A \cap B) = P(A) \bullet P(B)$
The denominator is the total total for each!

90. Juan and Filipe practice at the driving range before playing golf. The number of wins and corresponding practice times for each player are shown in the table below. Determine whether or not the two events "Filipe wins" and "long practice time" are independent. Justify your answer.

A B A

	Juan Wins	Felipe Wins	
Short Practice Time	8	10	18
B Long Practice Time	15	12	27
	23	22	45

$P(A \cap B) = P(A) \cdot P(B)$

$\frac{12}{45} = \frac{22}{45} \cdot \frac{27}{45}$

$\frac{4}{15} \neq \frac{22}{75}$ Not Independent

91. The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

92. The weights of bags of Graseck's Chocolate Candies are normally distributed with a mean of 4.3 ounces and a standard deviation of 0.05 ounces. What is the probability that a bag of these chocolate candies weighs less than 4.27 ounces?

1) 0.2257 3) 0.7257
2) 0.2743 4) 0.7757

normal cdF
lower = -9999999
upper = 4.27
μ = 4.3
σ = .05

Normal Distributions
2nd vars: 2:normal cdf
Lower = lower bound, Upper = upper bound, μ= mean, σ= standard deviation

Less than 3:	More than 3:	Between 3 and 6
Lower: -99999999999 Upper 3	Lower: 3 Upper: 9999999999	Lower: 3 Upper: 6

If asked for:

Probability	Percent	Quantity
You're done!	Multiply by 100	Multiply by the total quantity

93. The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *more* than 8.25 pounds.

94. The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

Statistical Studies

A *survey (sample survey)* is ***asking questions.***

*A census (population survey) is asking every member of the population (RARELY practical).

An *observational study* ***observes*** data WITHOUT ADMINISTERING A TREATMENT.

A *controlled experiment* ADMINISTERS A TREATMENT.

95. Which scenario is best described as an observational study?

1) For a class project, students in Health class ask every tenth student entering the school if they eat breakfast in the morning. Survey

2) A social researcher wants to learn whether or not there is a link between attendance and grades. She gathers data from 15 school districts.
observational study
no treatment is applied.

3) A researcher wants to learn whether or not there is a link between children's daily amount of physical activity and their overall energy level. During lunch at the local high school, she distributed a short questionnaire to students in the cafeteria. Survey

4) Sixty seniors taking a course in Advanced Algebra Concepts are randomly divided into two classes. One class uses a graphing calculator all the time, and the other class never uses graphing calculators. A guidance counselor wants to determine whether there is a link between graphing calculator use and students' final exam grades. Controlled experiment

96. A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study *best* describes this situation?

1) census
2) survey
3) observation
4) controlled experiment

97. A market research firm needs to collect data on viewer preferences for local news programming in Buffalo. Which method of data collection is most appropriate?
1) census
2) survey
3) observation
4) controlled experiment

Surveys (Choosing a sample)
A good sample is random. For example, every fifth student walking into the building.
A bad sample is bias. Don't ask the soccer team if they like soccer.

98. Which statement(s) about statistical studies is true?
I. A survey of all English classes in a high school would be a good sample to determine the number of hours students throughout the school spend studying. ✓
II. A survey of all ninth graders in a high school would be a good sample to determine the number of student parking spaces needed at that high school. X only asked 9th grades (they don't drive)
III. A survey of all students in one lunch period in a high school would be a good sample to determine the number of hours adults spend on social media websites. X students aren't in the population.
IV. A survey of all Calculus students in a high school would be a good sample to determine the number of students throughout the school who don't like math. X not everyone takes Calc and those who do are better at math.

1) I, only 2) II, only 3) I and III 4) III and IV

99. Which survey is *least* likely to contain bias?
1) surveying a sample of people leaving a movie theater to determine which flavor of ice cream is the most popular
2) surveying the members of a football team to determine the most watched TV sport
3) surveying a sample of people leaving a library to determine the average number of books a person reads in a year
4) surveying a sample of people leaving a gym to determine the average number of hours a person exercises per week

100. A survey is to be conducted in a small upstate village to determine whether or not local residents should fund construction of a skateboard park by raising taxes. Which segment of the population would provide the most unbiased responses?
1) a club of local skateboard enthusiasts
2) senior citizens living on fixed incomes
3) a group opposed to any increase in taxes
4) every tenth person 18 years of age or older walking down Main St.

101. A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

Sample Distributions

To determine if something is usual or unusual, expected or unexpected:

1) Find the confidence interval!!

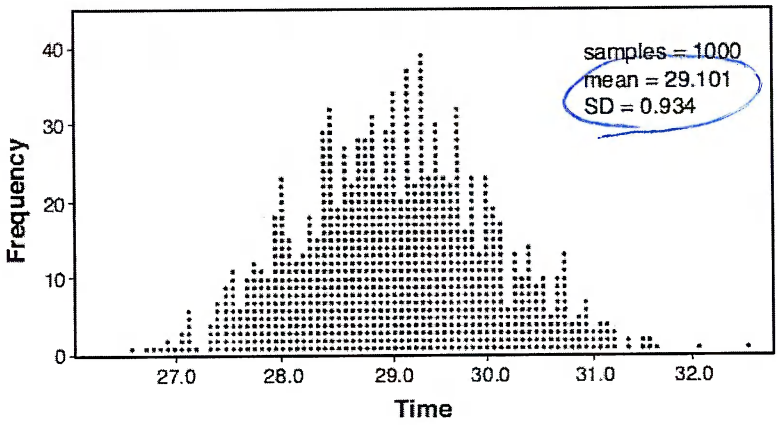
Confidence Interval = mean ± 2(Standard Deviation)

2) Determine if the given value is inside or outside the confidence interval.

If inside, it is an expected value

If outside, it is not an expected value

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth*.

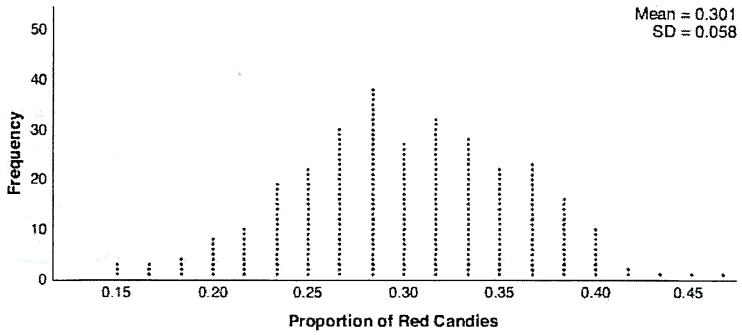
CI = 29.101 + 2(.934) = 30.97

29.101 − 2(.934) = 27.23

(27.23, 30.97)

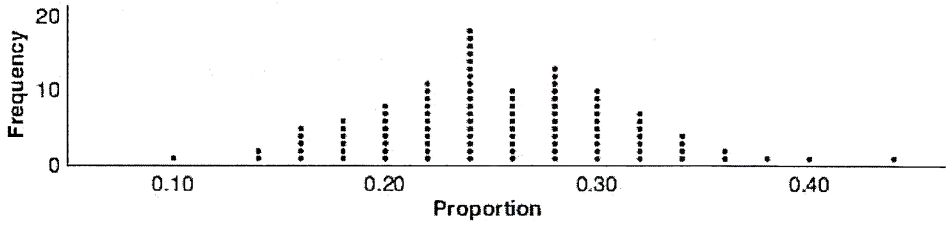
Yes, 30 is inside the confidence interval.

102. Mary bought a pack of candy. The manufacturer claims that 30% of the candies manufactured are red. In her pack, 14 of the 60 candies are red. She ran a simulation of 300 samples, assuming the manufacturer is correct. The results are shown below.



Based on the simulation, determine the middle 95% of plausible values that the proportion of red candies in a pack is within. Based on the simulation, is it unusual that Mary's pack had 14 red candies out of a total of 60? Explain.

103. A group of students was trying to determine the proportion of candies in a bag that are blue. The company claims that 24% of candies in bags are blue. A simulation was run 100 times with a sample size of 50, based on the premise that 24% of the candies are blue. The approximately normal results of the simulation are shown in the dot plot below.

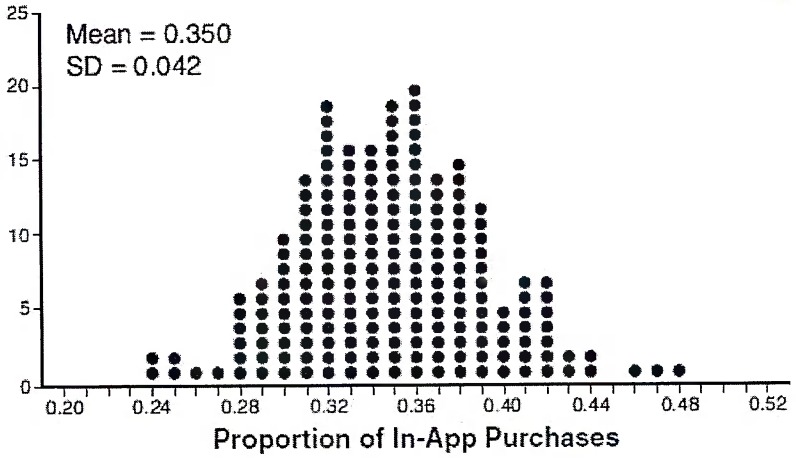


The simulation results in a mean of 0.254 and a standard deviation of 0.060. Based on this simulation, what is a plausible interval containing the middle 95% of the data? A student found that 18 out of 50 of the candies were blue. Use statistical evidence to explain why this is an expected value.

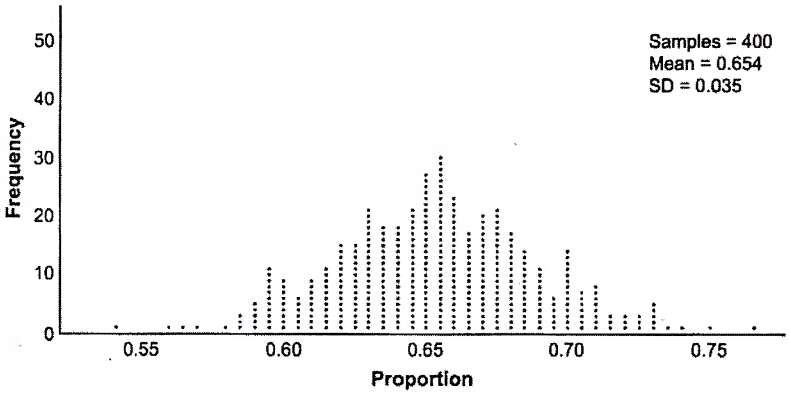
Margin Of Error
MOE=2(SD)

104. Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below. Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results.

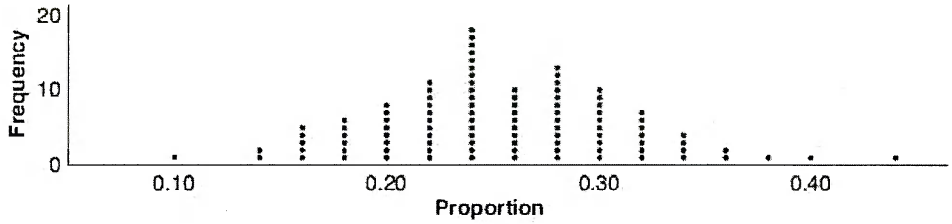
MOE=2(SD)
=2(.042)
=.08



105. Betty conducted a survey of her class to see if they like pizza. She gathered 200 responses and 65% of the voters said they did like pizza. Betty then ran a simulation of 400 more surveys, each with 200 responses, assuming that 65% of the voters would like pizza. The output of the simulation is shown below. Considering the middle 95% of the data, what is the margin of error for the simulation?



106. A group of students was trying to determine the proportion of candies in a bag that are blue. The company claims that 24% of candies in bags are blue. A simulation was run 100 times with a sample size of 50, based on the premise that 24% of the candies are blue. The approximately normal results of the simulation are shown in the dot plot below.



The simulation results in a mean of 0.254 and a standard deviation of 0.060. Based on this simulation, what is the margin of error?

Solving Quadratic Equations Using the Quadratic Formula
IF MULTIPLE CHOICE:
APPS, PLYSMLT2, 1: POLY ROOT FINDER, change to bi form
Type each choice in to match up the decimal.

107. What are the solutions to $4x^2 - 7x - 2 = -10$

+10 +10

$4x^2-7x+8=0$

PlySmlt2

$x=\frac{7}{8}\pm 1.111024302i$

1) $-\frac{1}{4}, 2$

2) $\frac{7}{8} \pm \frac{\sqrt{79}}{8}i$ 1.111024302i

3) $\frac{7}{8} \pm \frac{\sqrt{241}}{8}$

4) $\frac{7}{8} \pm \frac{\sqrt{143}}{8}i$

108. The solutions to the equation $3x^2 - 4x + 2 = 2x - 3$ are

1) $\frac{2}{3} \pm \frac{\sqrt{2}}{3}i$

2) $1 \pm \frac{\sqrt{6}}{3}i$

3) $1 \pm \frac{\sqrt{12}}{3}$

4) $1 \pm 2\sqrt{6}i$

109. The roots of the equation $0 = x^2 + 6x + 10$ in simplest $a + bi$ form are

1) $-3 \pm 2i$

2) $-6 \pm i$

3) $-3 \pm i$

4) $-3 \pm i\sqrt{2}$

Algebra II Reference Sheet (NGLS)

Quadratic Formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Trigonometric Identities	$\sin^2(\theta) + \cos^2(\theta) = 1$ $\tan(\theta) = \dfrac{\sin(\theta)}{\cos(\theta)}$ $\quad \cot(\theta) = \dfrac{\cos(\theta)}{\sin(\theta)}$ $\csc(\theta) = \dfrac{1}{\sin(\theta)}$ $\quad \sec(\theta) = \dfrac{1}{\cos(\theta)}$
Cubic Factorizations	$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
Probability (and / or)	$P(A \cap B) = P(A) + P(B) - P(A \cup B)$ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $P(A\|B) = \dfrac{P(A \cap B)}{P(B)}$
Independence (and)	$P(A \cap B) = P(A) \cdot P(B)$ $P(A\|B) = P(A)$

Arithmetic Sequence	$a_n = a_1 + d(n-1)$
Arithmetic Series	$S_n = \dfrac{n(a_1 + a_n)}{2}$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \dfrac{a_1(1-r^n)}{1-r}, r \neq 1$ $S_n = \sum_{k=1}^{n} a_1 r^{k-1}, r \neq 1$
Exponential Growth and Decay (NCCHI)	$A = P(1 \pm r)^t$ Nothing Below $A = P\left(1 + \dfrac{r}{n}\right)^{nt}$ Compounded $A = Pe^{rt}$ Continuously $A = A_0\left(\dfrac{1}{2}\right)^{\frac{t}{h}}$ half-life $A = P(1 \pm r)^{\frac{t}{h}}$ Irregular time

Normal Curve