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Date _____
Pre Calculus

Functions Review Sheet

Determine whether the following relations are 1-1 functions, functions not 1-1, or not functions

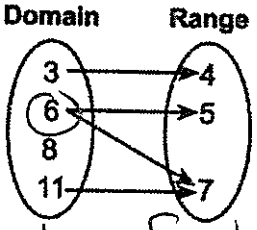
1. {(3,-2), (-2,3), (4,-1), (-1,4)}

1-1 Function

2. {(1,0), (2,0), (3,0), (4,0)}

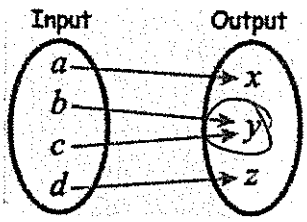
Function, not 1-1

3.



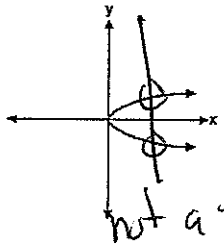
Not a function

4.



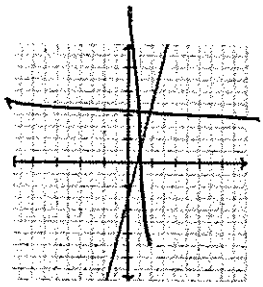
Function, not 1-1

5.



not a function

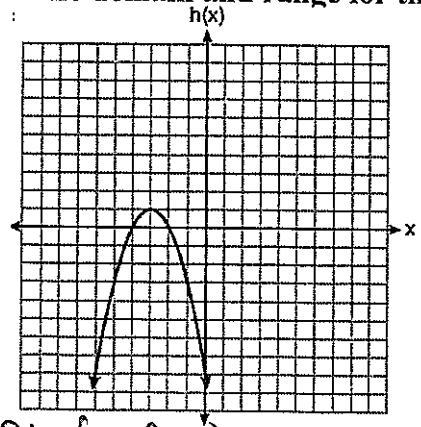
6.



1-1 Function

Find the domain and range for the functions below:

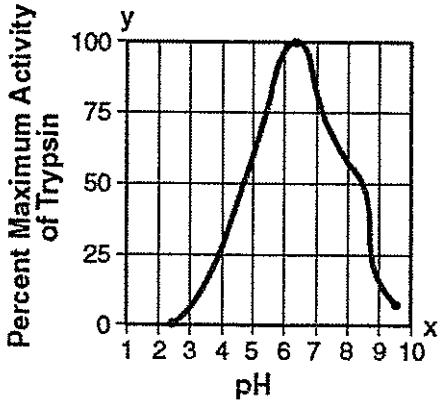
7.



D: $(-\infty, \infty)$

R: $[-\infty, 1]$

8.



D: $[2.5, 9.5]$

R: $[0, 100]$

Find the domain of the following functions algebraically

9. $f(x)=12-\frac{1}{2}x^2+7x$

$(-\infty,\infty)$

No restrictions

10. $f(x)=2^{x-8}+14$

$(-\infty,\infty)$

No restrictions

11. $f(x)=\sqrt{\frac{1}{2}x-8}$

radical

$\frac{1}{2}x-8\geq 0$

$+16 \quad +16$

$x\geq 16$

12. $g(x)=\sqrt{2-4x}$

radical

$2-4x\geq 0$

$-2 \quad -2$

$\frac{-4x}{-4}\geq\frac{-2}{-4}$ → switch inequality when dividing by a negative.

$x\leq\frac{1}{2}$

13. $f(x)=\frac{x-8}{x^2+8x+12}$

fraction

$x^2+8x+12=0$

$(x+6)(x+2)=0$

$x=-6 \quad x=-2$

$x\,|\,x\neq -6,-2$

14. $p(x)=\frac{x^2+5x-6}{x^2-5x+6}$

fraction

$x^2-5x+6=0$

$(x-3)(x-2)=0$

$x=3 \quad x=2$

$x\,|\,x\neq 2,3$

15. $p(x)=\frac{x-8}{\sqrt{2x-12}}$

Radical in denominator

$2x-12>0$

$+12 \quad +12$

$\frac{2x}{2}>\frac{12}{2}$

$x>6$

16. $q(x)=\frac{14}{\sqrt{12-4x}}+8$

Radical in denominator

$12-4x>0$

$-12 \quad -12$

$\frac{-4x}{-4}>\frac{-12}{-4}$ → switch inequality when dividing by a negative.

$x<3$

If $f(x)=6x-3$ and $g(x)=2x^2+x$, find:

17. f(3)

$f(3)=6(3)-3$

$f(3)=15$

18. g(-2)

$g(-2)=2(-2)^2+(-2)$

$g(-2)=6$

19. f(g(1))

$g(1)=2(1)^2+(1)$

$g(1)=3$

$f(3)=6(3)-3$

$f(3)=15$

20. $(g\circ f)(-2)$

$f(-2)=6(-2)-3$

$f(-2)=-15$

$g(-15)=2(-15)^2+(-15)$

$g(-15)=435$

21. $f(x+4)$

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

$=6x+24-3$

$=6x+21$

22. $g(x-1)$

$g(x-1)=2(x-1)^2+(x-1)$

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

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

$2x^2-2x-2x+2+x-1$

$2x^2-3x+1$

23. $(f\circ g)(x)$

$g(x)=2x^2+x$

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

$=12x^2+6x-3$

24. $g(f(x))$

$f(x)=6x-3$

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

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

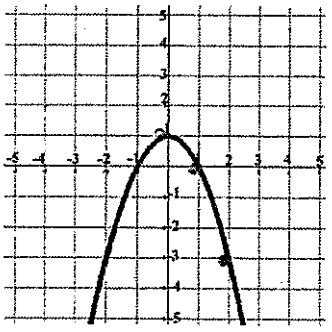
$(12x-6)(6x-3)+6x-3$

$72x^2-36x-36x+18+6x-3$

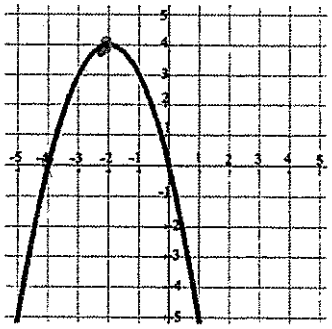
$72x^2-66x+15$

Use the followings graphs to answer the questions that follow:

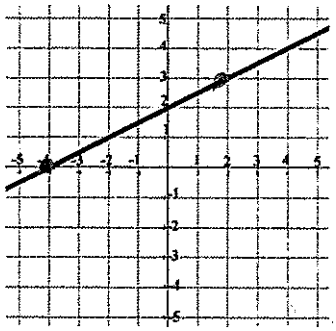
f(x)



g(x)



h(x)



25. h(2)

$h(2)=3$

26. g(−2)

$g(-2)=4$

27. h(g(-4))

$g(-4)=0$ $h(0)=2$

~~$h(-4)=0$~~

28. $(f\circ f)(1)$

$f(1)=0$

$f(0)=1$

→ switch x and y

Find the inverse of the following functions algebraically

29. $f(x) = \frac{1}{2}x + 8$

$y = \frac{1}{2}x + 8$

$2(x) = \frac{1}{2}y + 8)2$

$2x = y + 16$

$-16 \quad -16$

$2x - 16 = y$

$f^{-1}(x) = 2x - 16$

30. $f(x) = -6x + \frac{1}{2}$

$y = -6x + \frac{1}{2}$

$2(x) = -6y + \frac{1}{2})2$

$2x = -12y + 1$

$\frac{2x - 1}{-12} = \frac{-12y}{-12}$

$-\frac{1}{6}x + \frac{1}{12} = y$

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

Algebraically determine if the following two functions are inverses of each other using composition

$f(g(x)) = x$

31. $f(x) = 4x - 1,\ g(x) = \frac{1}{4}x + 1$

$f(g(x)) =$

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

$= x + 4 - 1$

$= x + 3$

No, they are not inverses of each other because $f(g(x)) \neq x$.

32. $f(x) = \frac{3}{2}x - 6,\ g(x) = \frac{2}{3}x + 4$

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

$= x + 6 - 6$

$= x$

Yes, they are inverses of each other because $f(g(x)) = x$

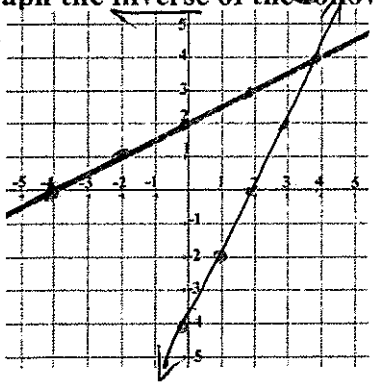
$f(x)$	
x	y
-3	8
-2	4
-1	1
0	0
1	1
2	4
3	8

$f^{-1}(x)$	
x	y
8	-3
4	-2
1	-1
0	0
1	1
4	2
8	3

Graph the inverse of the following functions on the same grid

switch x and y

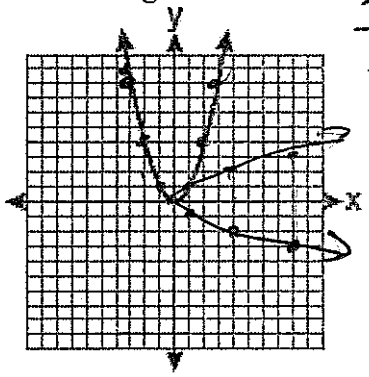
33.



$f(x)$	
x	y
-4	0
-2	1
0	2
2	3
4	4

$f^{-1}(x)$	
x	y
0	-4
1	-2
2	0
3	2
4	4

34.



For each of the following, state how the parent function was transformed.

35. $f(x) = -|2(x+3)| - 2$ $f(x) = |x|$

reflection over left 3 down 2

x-axis

horizontal compression by a scale factor of 2

reflection over y-axis

36. $f(x) = 2(-(x-4)^2 + 3$ up 3 $f(x) = x^2$

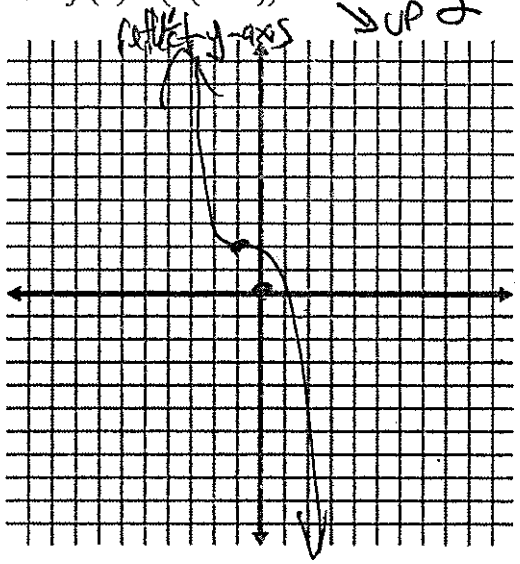
right 4

vertical stretch by a scale factor of 2

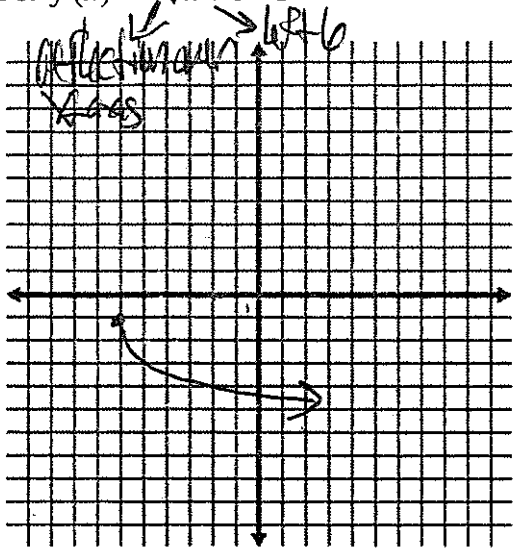
$f(x)=x^3$ left 1 $f(x)=\sqrt{x}$ 1 down

Sketch the graph for each of the following on the provided grid

37. $f(x)=(-(x+1))^3+2$ reflect y-axis up 2

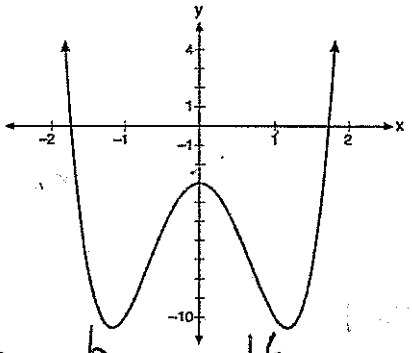


38. $f(x)=-\sqrt{x+6}-1$ reflect x-axis left 6



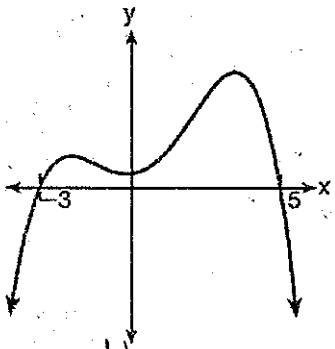
Graphically determine whether the following are even functions, odd functions, or neither. Explain your answer.

39.



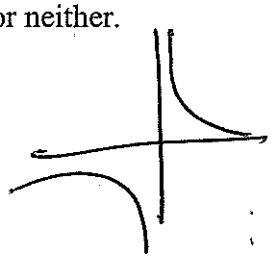
even because it's symmetric to the y-axis

40.



neither

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



odd because it's symmetric to the origin

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

42. $f(x)=2x^4-6x^3+1$

$f(-x)=2(-x)^4-6(-x)^3+1$

$=2x^4+6x^3+1$

neither

43. $f(x)=2-3x^2-7x^6$

$f(-x)=2-3(-x)^2-7(-x)^6$

$=2-3x^2-7x^6$

even because $f(-x)=f(x)$

44. $f(x)=2x^3+4x^5-x$

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

$=-2x^3-4x^5+x$

odd because $f(-x)=-f(x)$

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

45. 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.

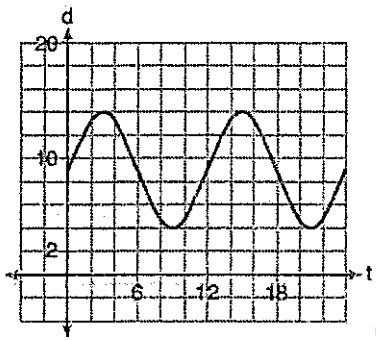
Month	Hours of Daylight
Jan.	9.4
Feb.	10.6
March	11.9
April	13.9
May	14.7
June	15.4
July	15.1
Aug.	13.9
Sept.	12.5
Oct.	11.1
Nov.	9.7
Dec.	9.0

x	y
1	9.4
4	13.9

$\frac{13.9 - 9.4}{4 - 1} = 1.5$

On average, from January 1 to April 1, the hours of daylight increases by 1.5 hours per month.

46. 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? Explain its meaning in the context of the problem.



x	y
3	14
9	4

$\frac{4 - 14}{9 - 3} = -\frac{5}{3}$

On average, from 3AM to 9AM, the depth of the water decrease by $\frac{5}{3}$ ft per hour

47. The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560(2.61)^{0.0187t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in millions of people per year, from $4 \le t \le 8$. Round your answer to the *nearest hundredth*. Explain its meaning in the context of the problem.

x	y
4	2750.5
8	2955.1

$\frac{2955.1 - 2750.5}{8 - 4} = 51.15$

On average, from 1954 to 1958, the world population increased by 51.15 million people per year