PreCalculus **Name:**_____
Chapter 1 Test Review **Date:**_____ **Period**_____

Find the domain of each of the following functions. Then express your answer in interval notation.

1. $f(x)=\frac{5}{x-3}$ D: $(-\infty,\infty)$, $x\neq 3$

2. $f(x)=\frac{x-6}{x+1}$ D: $(-\infty,\infty)$, $x\neq -1$

3. $f(x)=\frac{x-4}{x^2-9}$ D: $(-\infty,-3)(-3,3)(3,\infty)$

4. $f(x)=\frac{3x+1}{x^2+4}$ D: $(-\infty,\infty)$

5. $f(x)=\frac{x^2+6x+5}{x^2-11x+28}$ $(x-4)(x-7)$ D: $(-\infty,4)(4,7)(7,\infty)$

6. $f(x)=\frac{3x+15}{x^2+8x-20}\rightarrow(x+10)(x-2)$ D: $(-\infty,-10)(-10,2)(2,\infty)$

7. $f(x)=\sqrt{x}$ D: $[0,\infty)$

8. $f(x)=\sqrt{x-5}$ D: $[5,\infty)$

9. $f(x)=\sqrt{x+7}$ D: $[-7,\infty)$

10. $f(x)=\frac{\sqrt{x-3}}{x-7}$ D: $[3,7)(7,\infty)$

Find the domain and range of each of the following functions. Express answers in interval notation.

11. a. $f(x)=\sqrt{x}$ D: $[0,\infty)$ R: $[0,\infty)$

b. $f(x)=\sqrt{x}-6$ D: $[0,\infty)$ R: $[-6,\infty)$

c $f(x)=\sqrt{x-6}$ D: $[6,\infty)$ R: $[0,\infty)$

d. $f(x)=\sqrt{x-6}+3$ D: $[6,\infty)$ R: $[3,\infty)$

12. If $f(x)=5x-4$, evaluate the following:

a. $f(3)=5(3)-4=11$ $f(3)=11$

b. $f(a+3)=5(a+3)-4$ $f(a+3)=5a+11$

c. $f(a)+3=(5(a)-4)+3$ $f(a)+3=5a-1$

d. $f(a)+f(3)=5a-4+(5(3)-4)$ $f(a)+f(3)=5a+7$

13. Find the slope-intercept form of the equation of the line that passes through the given points.

a. (0, 0) and (1, 1) $m=1$ $y-0=1(x-0)$ $y=1x$

b. (-2, 1) and (2, 3) $m=\frac{2}{4}=\frac{1}{2}$ $y-1=\frac{1}{2}(x+2)$ $y=\frac{1}{2}x+2$

14. Find the slope-intercept form of the equation and determine the slope and the y-intercept.

a. $2y+5x-8=0$ $2y=-5x+8$ $y=-\frac{5}{2}x+4$ $m=-\frac{5}{2}$ $b=4$

b. $12x=6y+4$ $6y=12x-4$ $y=2x-\frac{2}{3}$ $m=2$ $b=-\frac{2}{3}$

15. Evaluate the following:

$$If\ f(x) = \begin{cases} 3x^2, if\ x < 0 \\ 4,\ if\ 0 \le x \le 2, \\ x+5,\ if\ x \ge 2 \end{cases}$$

just less than

greater than or equal to

Find a. f(0) = 4 b. f(-6) = $3(-6)^2$ $= 3 \cdot 36$ $= 108$ c. f(2) = 7 d. f(1) = 4

16. For each of the following problems, find f(x + h):

a. $f(x) = 7x - 4$

$f(x+h) = 7(x+h) - 4$

$= 7x + 7h - 4$

b. $f(x) = x^2 + 5x - 2$

$f(x+h) = (x+h)^2 + 5(x+h) - 2$

$= x^2 + h^2 + 2xh + 5x + 5h - 2$

c. $f(x) = \frac{1}{x}$

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

Use the Property of Inverse Functions to determine whether each of the following pairs of functions are inverses of each other.

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

$(f \cdot g)(x) = 4\left(\frac{1}{4}x + 1\right) - 1$

$= x + 4 - 1$

$= x + 3$

NO

18. $f(x) = x^3 - 2;\ g(x) = \sqrt[3]{x+2}$

$(f \circ g)(x) = \left(\sqrt[3]{x+2}\right)^3 - 2$

$= x + 2 - 2$

$= x$

$(g \circ f)(x) = \sqrt[3]{(x^3 - 2) + 2}$

$= \sqrt[3]{x^3}$

$= x$

YES

19. If a function is odd, then it is symmetric with respect to the origin.
(*x*-axis, *y*-axis, or origin?)

20. If a function is even, then it is symmetric with respect to the y-axis.
(*x*-axis, *y*-axis, or origin?)

Determine whether each of the following functions is even, odd, both or neither.

21. $f(x) = x^3 - 5x$

$f(-x) = (-x)^3 - 5(-x)$

$= -x^3 + 5x$

$f(-x) = -(x^3 - 5x)$

matches $-f(x)$

ODD

22. $f(x) = x^4 + 2x^2$

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

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

matches $f(x)$

EVEN

23. Find equations for the lines through the point (1, 5) that are parallel to and perpendicular to the line with equation y + 4x = 7.

$y = -4x + 7$

parallel

$m = -4$

$(1, 5)$

$y - 5 = -4(x - 1)$

$y = -4x + 9$

perpendicular

$m = \frac{1}{4}$

$(1, 5)$

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

$y = \frac{1}{4}x + \frac{19}{4}$

31. A function is given by the table of values. Determine if it is one-to-one.

a.

x	1	2	3	4	5	6
f(x)	1.5	2	3.6	5.3	2.8	2

repeated outputs means not 1-1

b.

x	1	2	3	4	5	6
f(x)	1	1.9	2.8	3.5	3.1	2.9

YES, 1-1

32. Find a formula for the inverse of the function $f(x) = 1 + \sqrt{2+3x}$.

$x = 1 + \sqrt{2+3y}$

$x - 1 = \sqrt{2+3y}$

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

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

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

33. Determine function f and g such that $h(x) = f(g(x))$.

a. $h(x) = (x+1)^3$ $f(x) = x^3$ $g(x) = x+1$

b. $h(x) = \sqrt{x^2+4}$ $f(x) = \sqrt{x}$ $g(x) = x^2+4$

34. Find equations for the lines through the point (a, b) that are parallel and perpendicular to the line $y = mx + b$, assuming $m \neq 0$.

35. Given the graph of f find the following information.

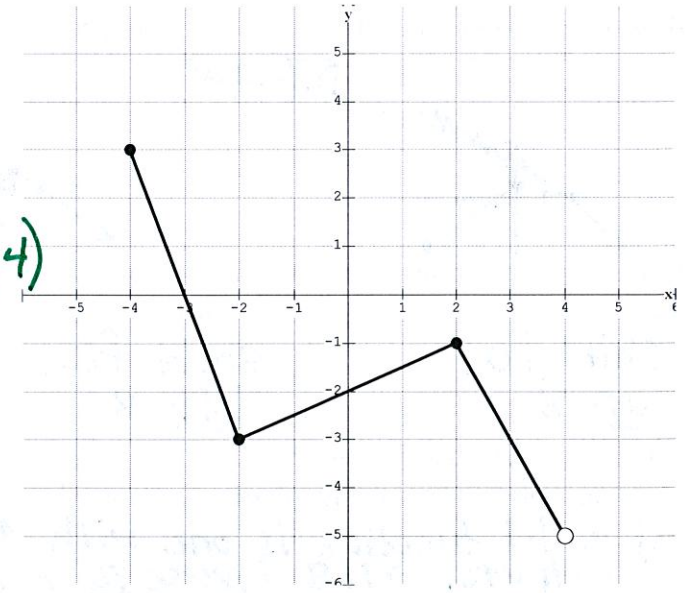
Domain: $[-4, 4)$

Range: $(-5, 3]$

Increasing: $[-2, 2]$

Decreasing: $[-4, -2], [2, 4)$

$f(-2) = -3$



36. Describe the graph of g compared to the graph of $f(x) = |x|$. Do NOT sketch the graphs.

a. $g(x) = \frac{1}{2}|x| + 10$

v. shrink by $\frac{1}{2}$

up 10

b. $g(x) = |x-2| - 3$

Shift right 2

down 3

24. Find a linear function that generates the values in the given table.

x	5.2	5.3	5.4	5.5	5.6
y	27.8	29.2	30.6	32	33.4

0.1 0.1 0.1 0.1 — 1.4 1.4 1.4 1.4

$m = \frac{1.4}{0.1} = 14$

Choose point → (5.5, 32)

$y - 32 = 14(x - 5.5)$

$y = 14x - 45$

25. For $f(n) = 3n^2 - 2$ and $g(n) = n + 1$, find and simplify:

a. $f(n) + g(n)$ $3n^2 - 2 + n + 1$ $3n^2 + n - 1$

b. $f(n)g(n)$ $(3n^2 - 2)(n + 1)$ $3n^3 + 3n^2 - 2n - 2$

c. $f(g(n))$ $3(n+1)^2 - 2$ $3(n^2 + 2n + 1) - 2$ $3n^2 + 6n + 1$

d. $g(f(n))$ $(3n^2 - 2) + 1$ $3n^2 - 1$

26. Evaluate the difference quotient for the given function. Simplify your answer.

a. $f(x) = 4 + 3x - x^2$, $\frac{f(3+h) - f(3)}{h}$ → $\frac{-h^2 - 3h + 4 - (4 + 3(3) - 3^2)}{h} = \frac{-h^2 - 3h}{h}$

$f(3+h) = 4 + 3(3+h) - (3+h)^2$

$= 4 + 9 + 3h - (h^2 + 6h + 9) = -h^2 - 3h + 4$

$= -h - 3$

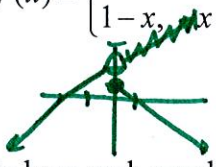
b. $f(x) = \frac{x+3}{x+1}$, $\frac{f(x) - f(1)}{x - 1}$ → $\frac{\frac{x+3}{x+1} - \left(\frac{1+3}{1+1}\right)}{x-1} = \frac{\frac{x+3}{x+1} - 2}{x-1} = \frac{x + 3 - 2(x+1)}{x+1}$

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

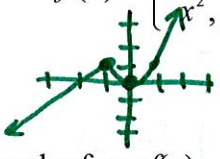
$= \frac{-1}{x+1}$

27. Find the domain and sketch the graph of the function.

a. $f(x) = \begin{cases} x + 2, & x < 0 \\ 1 - x, & x \geq 0 \end{cases}$ D: $(-\infty, \infty)$



b. $f(x) = \begin{cases} x + 2, & x \leq -1 \\ x^2, & x > -1 \end{cases}$ D: $(-\infty, \infty)$



28. Explain how each graph is obtained from the graph of $y = f(x)$.

a. $y = f(x) + 8$ shift $f(x)$ up 8

b. $y = f(x+8)$ shift $f(x)$ left 8

c. $y = -f(x) - 1$ reflect $f(x)$ and shift down 1

29. a. What is a one-to-one function?

b. How can you tell from the graph of a function whether it is one-to-one?

a) a 1-1 function is one with a unique set of inputs and outputs. → its inverse is a function

b) you can tell using the horizontal line test

30. Suppose f is a one-to-one function with domain A and range B. What is the domain of f^{-1}?

What is the range of f^{-1}?

Domain B

Range A

37. Find an equation of the function whose graph has the shape of $f(x) = x^2$ but has moved 4 units to the left and 2 units downward. $g(x) = (x+4)^2 - 2$

38. If $f(x) = 4 + x$ and $g(x) = x^2 - 1$, find $f(g(x))$ and $g(f(x))$.

$(f \circ g)(x) = 4 + x^2 - 1$
$= x^2 + 3$

$(g \circ f)(x) = (4+x)^2 - 1$
$= x^2 + 8x + 15$

39. Use the table to find each value.

a. $f(-2) = -1$
b. $g(1) = -2$
c. $f(g(2)) = f(3) = -2$
d. $(g \circ h)(1) = g(h(1))$
$= g(0) = 1$

x	-3	-2	-1	0	1	2	3
f(x)	2	-1	0	3	-3	1	-2
g(x)	-1	0	-3	1	-2	3	2
h(x)	1	3	-2	2	0	-3	-1

40. Find the inverse of the function $f(x)$.

$f(x) = \{(4,1),(3,2),(0,4)\}$

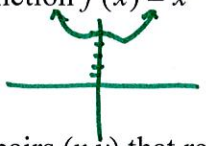
$f^{-1}(x) = \{(1,4),(2,3),(4,0)\}$

41. Given $f(x) = 2x - 4$, find $f^{-1}(x)$.

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

42. Determine if the function $f(x) = x^4 + 5$ is one-to-one.

NO



not 1-1
doesn't pass horiz. line test

43. Find a set of order pairs (x,y) that represents y as a function of x.

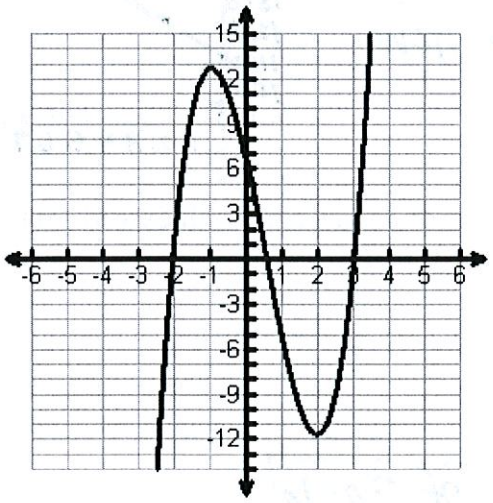
~~a. $\{(-1,4),(-1,3),(-1,2)\}$~~

~~b. $\{(2,3),(1,3),(2,6)\}$~~

~~c. $\{(4,3),(-2,0),(-2,3),(0,3)\}$~~

d. $\{(-1,2),(2,3),(3,-1),(4,3)\}$

44. Use the graph of the function to find: (a) the relative minimum and relative maximum, (b) the intervals on which the function is increasing, decreasing, or constant.



a.) $(2, -12) \rightarrow$ min
$(-1, 13) \rightarrow$ max

b.) inc. $\rightarrow (-\infty, -1], [2, \infty)$
dec. $\rightarrow [-1, 2]$

45. Use a graphing utility to find any relative minimum or maximum values of the function.

$f(x) = x^3 - 4x^2 + 2x + 3$ max: (0.28, 3.27)

min: (2.39, -1.42)

46. Find the slope-intercept form of the equation of the line through the point (0, -2) and perpendicular to the graph of $y = -3x - 3.4$

Slope = $\frac{1}{3}$

(0, -2) ← y-int.

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

47. Find the slope-intercept form of the equation of the line through the point (-3, -6) and parallel to the line $2x + 3y = 4$.

$3y = -2x + 4$

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

slope = $-\frac{2}{3}$

(-3, -6)

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

$y = -\frac{2}{3}x - 8$

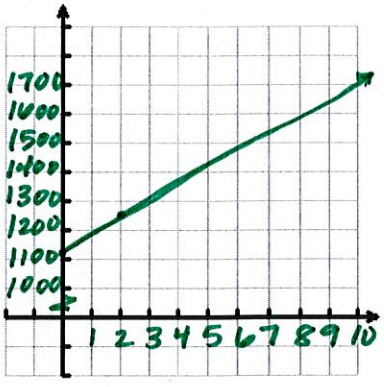
48. The table shows the number T of Target stores from 1997 to 2002.

Years (since 1997)	Number of stores, T
1997 (0)	1110
1998 (1)	1182
1999 (2)	1253
2000 (3)	1317
2001 (4)	1381
2002 (5)	1486

a. Use the regression feature of a graphing utility to find a linear model for the data. Let t represent the year, with $t = 0$ corresponding to 1997.

b. Use a graphing utility to plot the data and graph the model in the same viewing window.

$y = 72.6x + 1106.67$



c. Interpret the slope of the model in the context of the problem.

Slope → an average of 72.6 new stores per year

d. Use the model to find the year in which the number of Target stores will exceed 1800.

$1800 = 72.6x + 1106.67$

$693.33 = 72.6x$

$x = 9.55$

about the middle of 2006