/ (1) Odds only!

Name _____

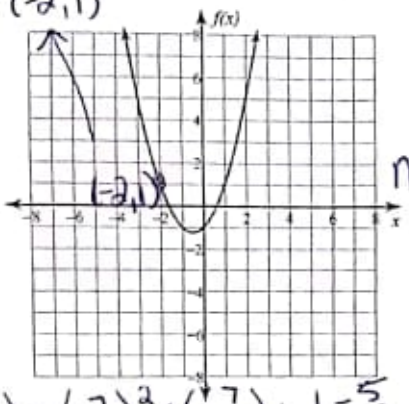
Average Rates of Change - Slope!

Date _____ Period ____

For each problem, find the average rate of change of the function over the given interval.

1) $f(x) = x^2 + x - 1$; $[-2, -\frac{7}{4}]$ $\frac{y_2 - y_1}{x_2 - x_1}$

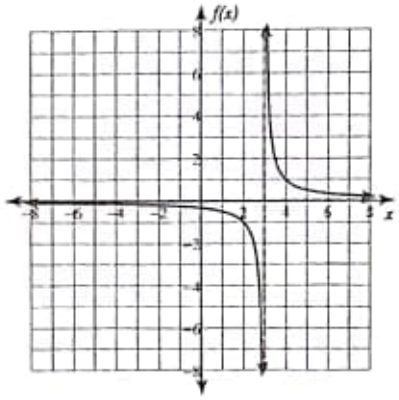
(-2, 1)



$m = \frac{1 - \frac{5}{16}}{-2 - (-\frac{7}{4})} =$ $\frac{-11}{4}$

$f(-\frac{7}{4}) = (-\frac{7}{4})^2 + (-\frac{7}{4}) - 1 = \frac{5}{16}$

2) $f(x) = \frac{1}{x-3}$; $[-2, -\frac{3}{2}]$



3) $f(x) = x^2 - x - 1$; $[3, \frac{13}{4}]$

$f(3) = 3^2 - 3 - 1 = 5$

$f(13/4) = \frac{13}{4}^2 - \frac{13}{4} - 1 = \frac{101}{16}$

$\frac{5 - \frac{101}{16}}{3 - \frac{13}{4}} = \frac{81}{4}$

4) $f(x) = -x^2 - x + 1$; $[2, \frac{7}{3}]$

5) $f(x) = 2x^2 - 2x - 1$; $[1, \frac{3}{2}]$

$f(1) = 2(1)^2 - 2(1) - 1 = -1$

$f(3/2) = 2(3/2)^2 - 2(3/2) - 1 = 1/2$

$\frac{-1 - 1/2}{1 - 3/2} =$ 3

6) $f(x) = \frac{1}{x-1}$; $[-4, -\frac{11}{3}]$

7) $f(x) = \frac{1}{x+3}$; $[-1, -\frac{2}{3}]$

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

$f(-2/3) = \frac{1}{-\frac{2}{3}+3} = 3/7$

$\frac{\frac{1}{2} - \frac{3}{7}}{-1 - \frac{-2}{3}} = \frac{-3}{14}$

8) $f(x) = -\frac{1}{x-1}$; $[-4, -\frac{7}{2}]$

9) The police have accused a driver of breaking the speed limit of 60 miles per hour. As proof, they provide two photographs. One photo shows the driver's car passing a toll booth at exactly 6 PM. The second photo shows the driver's car passing another toll both 31 miles down the highway at exactly 6:30 PM. Does the photo evidence prove that the driver broke the speed limit during this time?

Miles = 31

6pm - 6:30pm = 1/2 hour

$\text{Speed} = \frac{m}{h} = \frac{31}{\frac{1}{2}} = 62\text{mph}$

Yes, the driver was speeding. He was going 62mph which is more than 60mph.

(2)

Name: _____ Date: _____

Linear Functions Practice Problems

1) For $y = \frac{2}{3}x - 6$, which value represents the average rate of change of a line parallel to the equation.

A. $\frac{2}{3}$ B. $-\frac{3}{2}$ C. -6 D. $\frac{1}{6}$

2) For $2y - 13x = 6$, which value represents the average rate of change of a line normal to the equation.

$\frac{2y}{2} = \frac{13x}{2} + \frac{6}{2}$ perpendicular

$y = \frac{13}{2}x + 3$ → $m = -\frac{2}{13}$

A. $-\frac{13}{2}$ B. $\frac{1}{13}$ C. $-\frac{2}{13}$ D. $\frac{13}{6}$

3) Which is an equation of the line normal to $y = 1 - \frac{3}{4}x$ and passes through (3, 4)?

$y - 4 = \frac{4}{3}(x - 3)$ $m = \frac{4}{3}$

A. $y = \frac{4}{3}x - 7$ B. $y = -\frac{3}{4}x + \frac{25}{4}$ C. $y = -1x + 7$ D. $y = \frac{4}{3}x$

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

$y = \frac{4}{3}x$

4) Which is an equation of the line parallel to $4y - 7x = 8$ and passes through (-4, 0)?

$4y = 7x + 8$

$y = \frac{7}{4}x + 2$

$m = \frac{7}{4}$

A. $y = \frac{7}{4}x + 7$ B. $y = -7x - 28$ C. $y = -\frac{7}{4}x - 7$ D. $y = 7x + 28$

Write the general form of a line for each function.

5) $y = \frac{4}{3}x - 7$ → $= 0$

$-\frac{4}{3}x + 7$

$y - \frac{4}{3}x + 7 = 0$

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

$y - 1 = 2x - 4$

$-2x + 4$

$y - 2x + 3 = 0$

Write the slope-intercept form of a line for each function.

$y = mx + b$

6) $y + 3 = -5(x + 2)$

$y + 3 = -5x - 10$

$-3 \quad -3$

$y = -5x - 13$

7) $4y - 7x = 8$

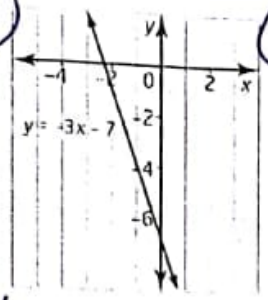
$+7x \quad +7x$

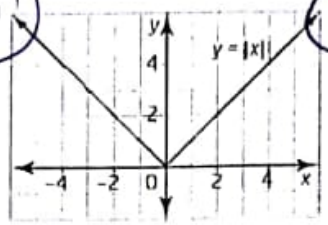
$\frac{4y}{4} = \frac{7x + 8}{4}$

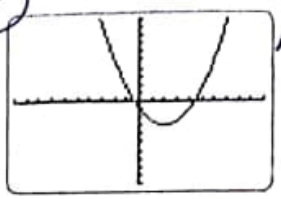
$y = \frac{7}{4}x + 2$

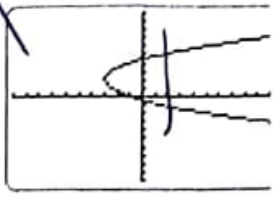
③ Functions, Domain, and Range - Worksheet

1) Which graphs represent functions? Justify your answer.

a) 

b) 

c) 

d) 

They pass the vertical line test

2) Is each relation a function? Explain and make a rough sketch of the graph of each.

a) $y = x - 5$ Yes
Linear function

b) $y = 2(x-1)^2 - 2$ Yes
Quadratic Function

c) $x^2 + y^2 = 4$ NO
Circle
$y = \pm\sqrt{-x^2+4}$

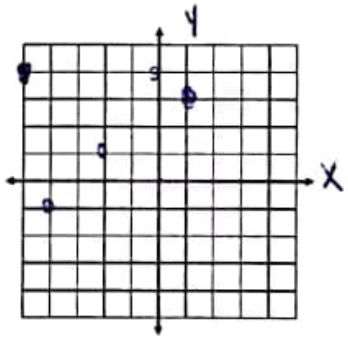
3) State the domain and range. Represent as a table and graph. Then state if it is a function.

a) {(-5, 4), (-4, -1), (-2, 1), (0, 4), (1, 3)}

Domain:
{-5, -4, -2, 0, 1}

Range:
{4, -1, 1, 4, 3}

x	y
-5	4
-4	-1
-2	1
0	4
1	3

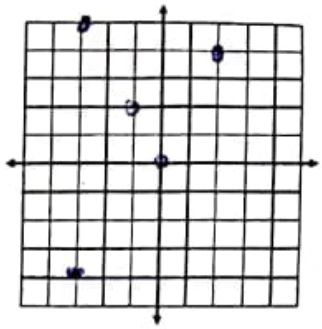


Is this relation a function? yes!

(4)

b) {(-3, -4), (-1, 2), (0, 0), (-3, 5), (2, 4)}

x	y
-3	-4
-1	2
0	0
-3	5
2	4



Domain:

$\{-3, -1, 0, 2\}$

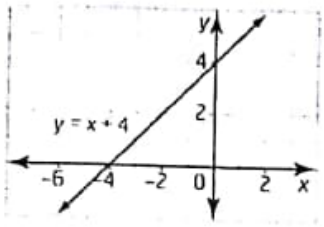
Range:

$\{-4, 2, 0, 5, 4\}$

Is this relation a function? NO!

4) State the domain and range of each relation. Then state if the relation is a function.

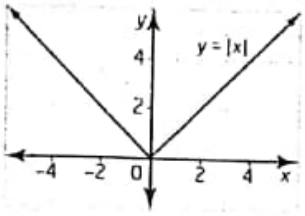
a)



Function

D: $\mathbb{R}$

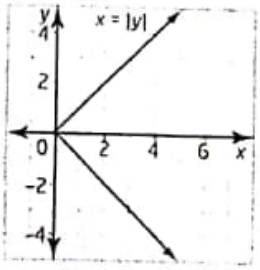
b)



Function

D: $\mathbb{R}$

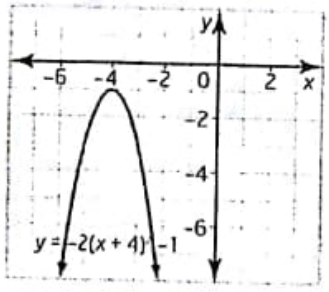
c)



Not a function

D: $x \geq 0$

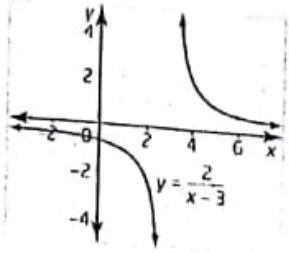
d)



Function

D: $\mathbb{R}$

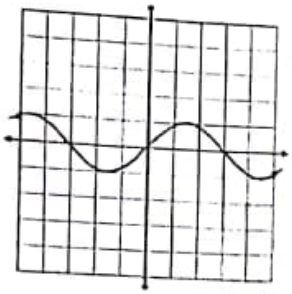
e)



Function

D: $\mathbb{R}$ except $x=3$

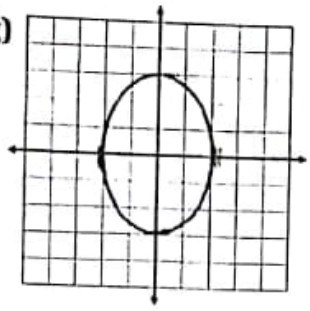
f)



Function

D = $\mathbb{R}$

g)



Not a function

D: $-2 \leq x \leq 2$

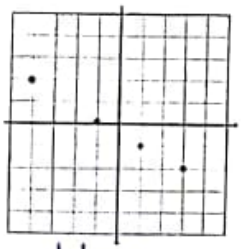
5) Which of the following relations are functions?

a)

x	y
2	−3
−1	0
5	5
3	2
2	1

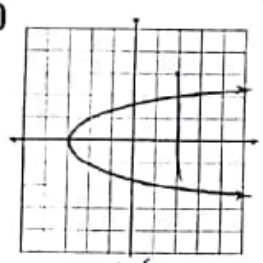
NO

b)



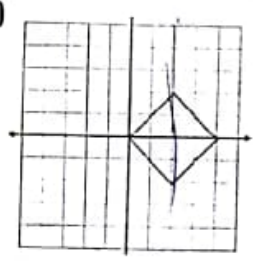
Yes

c)



NO

d)



NO

(6)

odds only!

Name_____

Date_____ Period_____

Evaluating Functions

Evaluate each function.

1) $h(t) = |t + 2| + 3$; Find $h(6)$

$h(6) = |6+2| + 3 = 11$

2) $g(a) = 3^{3a-2}$; Find $g(1)$

3) $w(t) = -2t + 1$; Find $w(-7)$

$w(-7) = -2(-7) + 1 = 15$

4) $g(x) = 3x - 3$; Find $g(-6)$

5) $h(n) = -2n^2 + 4$; Find $h(4)$

$h(4) = -2(4)^2 + 4 = -28$

6) $h(t) = -2 \cdot 5^{-t-1}$; Find $h(-2)$

7) $f(x) = x^2 - 3x$; Find $f(-8)$

$f(-8) = (-8)^2 - 3(-8) = 88$

8) $p(a) = -4^{3a}$; Find $p(-1)$

9) $p(t) = 4t - 5$; Find $p(t - 2)$

$p(t-2) = 4(t-2) - 5$

$= 4t - 8 - 5$

$= 4t - 13$

10) $g(a) = 4a$; Find $g(2a)$

11) $w(n) = 4n + 2$; Find $w(3n)$

$w(3n) = 4(3n) + 2$

$= 12n + 2$

12) $w(a) = a + 3$; Find $w(a + 4)$

13) $h(x) = 4x - 2$; Find $h(x + 2)$

$h(x+2) = 4(x+2) - 2$

$= 4x + 8 - 2$

$4x + 6$

14) $k(a) = -4^{3a+2}$; Find $k(a - 2)$

15) $g(n) = n^3 - 5n^2$; Find $g(-4n)$

$g(-4n) = (-4n)^3 - 5(-4n)^2$

$= -64n^3 - 5(16n^2)$

$= -64n^3 - 80n^2$

16) $f(n) = n^2 - 2n$; Find $f(n^2)$

17) $p(a) = a^3 - 5$; Find $p(x - 4)$

$(x-4)(x-4)(x-4)$

$p(x-4) = (x-4)^3 - 5$

$= x^3 - 8x^2 + 16x - 4x^2 + 32x - 64 - 5$

$= x^3 - 12x^2 + 48x - 69$

18) $h(t) = 2 \cdot 3^{t+3}$; Find $h(4 + t)$

(7)

Difference quotient review $\dfrac{f(x+h)-f(x)}{h}$

1) Given $f(x) = 4x^2$, find the difference quotient.

$$\frac{4(x+h)^2-4x^2}{h} = \frac{4(x^2+2xh+h^2)-4x^2}{h} = \frac{4x^2+8xh+4h^2-4x^2}{h}$$

$$\frac{8xh+4h^2}{h} = \frac{h(8x+4h)}{h} = 8x+4h$$

2) Given $f(x) = 2x^2 - x$, find the difference quotient.

$$\frac{[2(x+h)^2-(x+h)]-[2x^2-x]}{h} = \frac{2(x^2+2xh+h^2)-x-h-2x^2+x}{h}$$

$$\frac{2x^2+4xh+2h^2-x-h-2x^2+x}{h} = \frac{4xh+2h^2-h}{h} = \frac{h(4x+2h-1)}{h}$$

$$= 4x^2+2h-1$$

$(x+h)^3 = (x+h)(x+h)(x+h)$
$= (x+h)(x^2+2xh+h^2)$
$= x^3+3x^2h+3xh^2+h^3$

3) Given $f(x) = 9 - 2x^3$, find the difference quotient.

$$\frac{[9-2(x+h)^3]-[9-2x^3]}{h} = \frac{9-2(x^3+3x^2h+3xh^2+h^3)-9+2x^3}{h}$$

$$= \frac{9-2x^3-6x^2h-6xh^2-2h^3-9+2x^3}{h} = \frac{-6x^2h-6xh^2-2h^3}{h} =$$

$$\frac{h(-6x^2-6xh-2h^2)}{h} = -6x^2-6xh-2h^2$$

(8)

Name:_____ Date:_____

Unit: Functions

CW: Finding the Domain Algebraically

Directions: *Find, algebraically the domain of each function. Restrict the domain wherever possible.* Odds only.

1) $d(y) = y + 3$

$\mathbb{R}$

(linear)

2) $g(k) = 2k^2 + 4k - 6$

3) $b(n) = \sqrt{2n-8}$

$2n - 8 \geq 0$

$+8 \quad +8$

$\frac{2n}{2} \geq \frac{8}{2}$

$n \geq 4$

4) $m(t) = \sqrt{9-3t}$

5) $u(x) = \frac{x-5}{2x+4}$

$2x + 4 = 0$

$2x = -4$

$x = -2$

$\mathbb{R}$ except $x = -2$

6) $a(r) = r + \frac{1}{r-1}$

7) $y(c) = \frac{2}{c^2 + 3c}$

$c^2 + 3c = 0$

$c(c + 3) = 0$

$c = 0 \quad c + 3 = 0$

$c = -3$

$\mathbb{R}$ except $x = 0$ and $x = -3$

8) $q(w) = \frac{w+4}{w^2 - 25}$

(9) *odds only!

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

Quadratic

10) $h(x) = \frac{1}{x^2 - 12x + 35}$

* 11) $f(x) = \frac{x}{\sqrt{x+3}}$

$x + 3 > 0$

$x > -3$

12) $t(v) = \sqrt{v^2 + 2v - 8}$

13) $h(x) = \sqrt{x^2 - 4x - 5}$

$x^2 - 4x - 5 \geq 0$

$(x-5)(x+1) \geq 0$

* Switch

$x - 5 \geq 0$ $\quad x + 1 \leq 0$

$x \geq 5$ $\quad x \leq -1$

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