Name Key HW#_____ Date_____

Unit 10-Quadratics Review

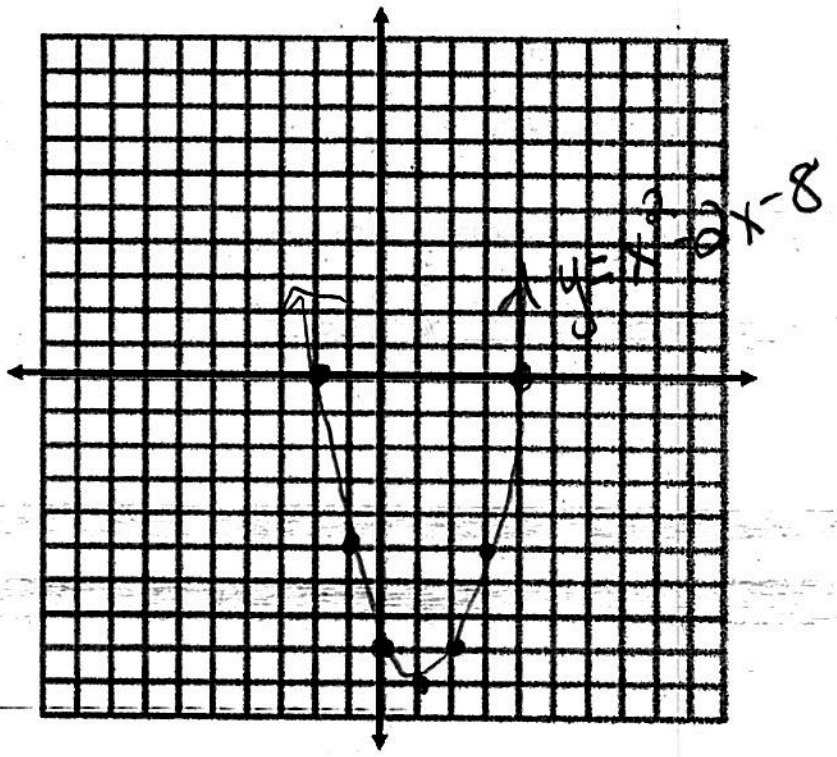
1. Given: $f(x)=x^2-2x-8$

a) Find the roots of the given equation ***algebraically***

$x^2-2x-8=0$

$(x-4)(x+2)=0$

$x=4 \quad | \quad x=-2$



b) Graph of the equation.

	x	y
R_1	-2	0
	-1	-5
	0	-8
TP	1	-9
	2	-8
	3	-5
R_2	4	0

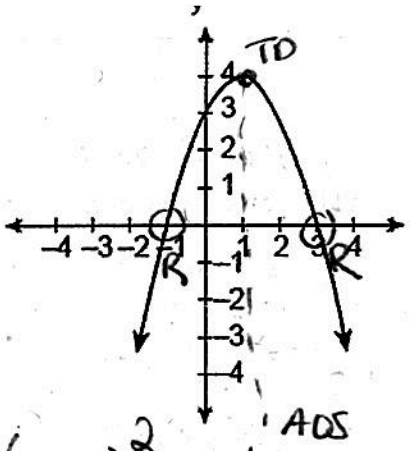
c) Find:

- Turning Point (1, -9)
- Roots {-2, 4}
- Axis of Symmetry x = 1
- y – intercept -8 (c value)
- Domain $\{x \mid x \in \mathbb{R}\}$
- Range $\{y \mid y \geq -9\}$
- Vertex form $y=(x-1)^2-9$
- State the increasing interval graphed $(1, \infty)$
- State the decreasing interval graphed $(-\infty, 1)$

2. Directions: Answer the following questions based on this graph of a parabola:

a) Write the equation for the axis of symmetry.

$x = 1$



b) Identify the x-intercepts.

$\{-1, 3\}$

c) Identify the y-intercept.

3

c) Write the quadratic equation of this graph:

In standard form: $y = -x^2 + 2x + 3$

In vertex form: $y = -(x-1)^2 + 4$

3. Find the vertex of $f(x) = -x^2 - 4x + 9$ ***ALGEBRAICALLY***.

$x = \frac{-b}{2a}$ $\boxed{x = -2}$

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

$x = \frac{4}{-2}$

$y = -(-2)^2 - 4(-2) + 9$

$y = -4 + 8 + 9$

$\boxed{y = 13}$

TP $(-2, 13)$

4. Describe how you know by looking at the equation of a quadratic function whether the graph will open upward or downward?

The graph will be opening downward b/c the $\ominus$ in front of x^2 (a value is negative)

5. American astronauts working on a space station on the moon toss a ball into the air. The height of the ball is represented by the equation $y = -2.7x^2 + 13.5x + 14$ where x represents the number of seconds since the ball was thrown and y represents the height of the ball in feet. Determine the height of the ball after 2 seconds. Show how you arrived at your answer.

x	y
0	14
1	24.8
2	30.2
3	30.2
4	24.8
5	14

30.2 ft

6. Given the quadratic equation: $x^2 - kx - 16 = 0$, where -2 is one solution.
   a) Find the value of k
   b) Find the missing root

a) $(-2)^2 - K(-2) - 16 = 0$

$4 + 2K - 16 = 0$

$2K - 12 = 0$

$+12 \quad +12$

$\frac{2K}{2} = \frac{12}{2}$ $\quad K = 6$

b) $x^2 - 6x - 16 = 0$

$(x-8)(x+2)$

$x = 8$ | $x = -2$

other root!

7. Write the quadratic equation in vertex form by completing the square. Then, identify the quadratic equation's turning point. $f(x) = x^2 - 2x + 8$

$\frac{2}{2} = (1)^2 = 1$

$F(x) = x^2 - 2x + 8$

$-8 \qquad -8$

$F(x) - 8 = x^2 - 2x$

$F(x) - 8 + 1 = x^2 - 2x + 1$

$f(x) - 7 = x^2 - 2x + 1$

$f(x) - 7 = (x-1)^2$

$+7 \qquad +7$

$F(x) = (x-1)^2 + 7$

TP (1, 7)

8. Write the quadratic equation in vertex form by completing the square. Then, identify the quadratic equation's turning point. $f(x)=2x^2+36x+170$

$\frac{F(x)}{2}=\frac{2x^2}{2}+\frac{36x}{2}+\frac{170}{2}$

$\frac{F(x)}{2}=x^2+18x+85$

$\frac{F(x)}{2}-85=x^2+18x$

$\frac{F(x)}{2}-85+81=x^2+18x+81$

$\frac{F(x)}{2}-4=(x+9)^2$

$+4 \qquad +4$

$\frac{F(x)}{2}=2(x+9)^2+4\cdot 2$

$F(x)=2(x+9)^2+8$

TP
$(-9,8)$

9. The populations of two different villages are modeled by the equations shown below. The population (in thousands) is represented by y and the number of years since 1975 is represented by x. Lewiston village is represent by $f(x)=x^2-30x+540$ Lockport village is represent by $g(x)=20x+15$

a. Algebraically, determine which year did the villages have the same population?

$x^2-30x+540=20x+15$

$-20x-15 \qquad -20x-15$

$x^2-50x+525=0$

$(x-35)(x-15)$

$x=35 \quad | \quad x=15$

1975 + 35 = 2010

1975 + 15 = 1990

b. Algebraically, determine what was the population of both cities during the year of equal population?

$y=20(35)+15$

$y=715$

in 2010 population was 715,000

$y=20(15)+15$

$y=315$

in 1990 population was 315,000.

10. If $(x - 7)$ is a factor of $2x^2 - 11x + k$, what is the value of k?

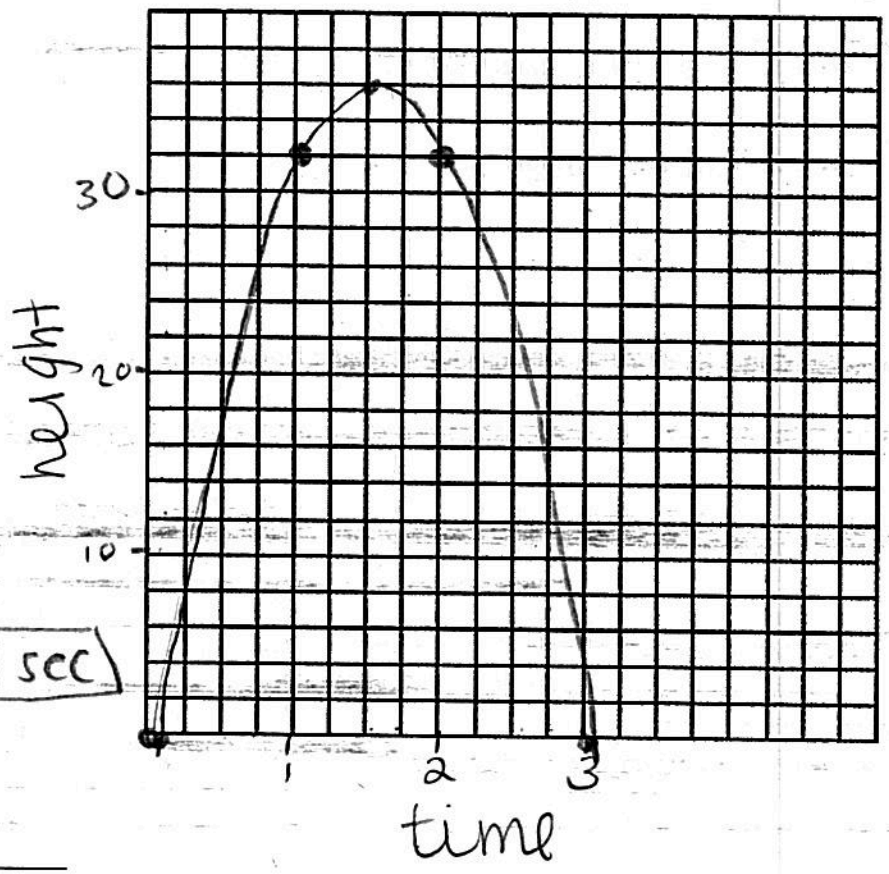
(1) -21 (2) -7 (3) 7 (4) 28

$2(7)^2 - 11(7) + k = 0$
$2(49) - 77 + k = 0$
$98 - 77 + k = 0$
$21 + k = 0$
$-21 \quad -21$
$k = -21$

11. The height, h, of a golf ball hit into the air can be represented by the equation $h = -16t^2 + 48t$, where t is the elapsed time.

a) Graph $h = -16t^2 + 48t$

X	Y
0	0
1	32
2	32
3	0



b) At what time is the ball at its highest point?

$x = \frac{-b}{2a}$ $x = \frac{-48}{-32}$

$x = \frac{-(48)}{2(-16)}$ $x = 1.5$ sec

c) Write the equation of the axis of symmetry.

$x = 1.5$

d) Domain $\{x \mid 0 \le x \le 3\}$

e) Range $\{y \mid 0 \le y \le 36\}$

f) State the increasing interval graphed $[0, 1.5]$

g) State the decreasing interval graphed $[1.5, 3]$

12. What is the solution of the system of equations shown below?

X	y_1	y_2
1	-1	-1
⋮		
8	6	6

$f(x) = x - 2$

$g(x) = x^2 - 8x + 6$

put in calc look @ table

(1) (-1,-3) and (-8,-10) (2) (2,0) and (-8,-10) (3) (0,-2) and (5,3 (4) (1,-1) and (8,6)

13. Which of the following equations is equivalent to $x^2+14x-14=0$

(1) $(x+7)^2=14$ (2) $(x+7)^2=63$ (3) $(x+14)^2=14$ (4) $(x+14)^2=63$

$x^2+14x=14$

$x^2+14x+49=14+49$

$(x+7)^2=63$

$\frac{14}{2}=(7)^2=49$

14. What are the vertex and axis of symmetry of the parabola $y=x^2-16x+63$?

(1) vertex: $(8,-1)$; axis of symmetry: $x=8$

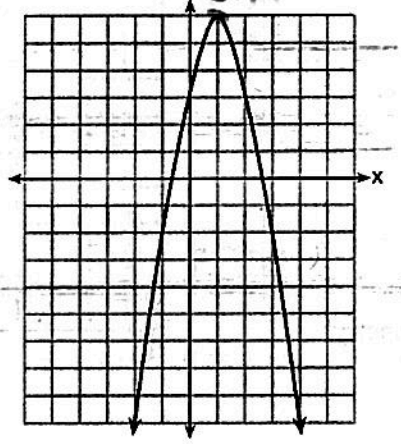
(2) vertex: $(8,1)$; axis of symmetry: $x=8$

(3) vertex: $(-8,-1)$; axis of symmetry: $x=-8$

(4) vertex: $(-8,1)$; axis of symmetry: $x=-8$

x	y
5	8
6	3
7	0
8	-1
9	0
10	3
11	8

15. Let f be the function represented by the graph below.



TP (1,6)

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. (*hint: find the maximum for g(x) algebraically)*

$x=\frac{-b}{2a}$

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

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

$x=4$

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

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

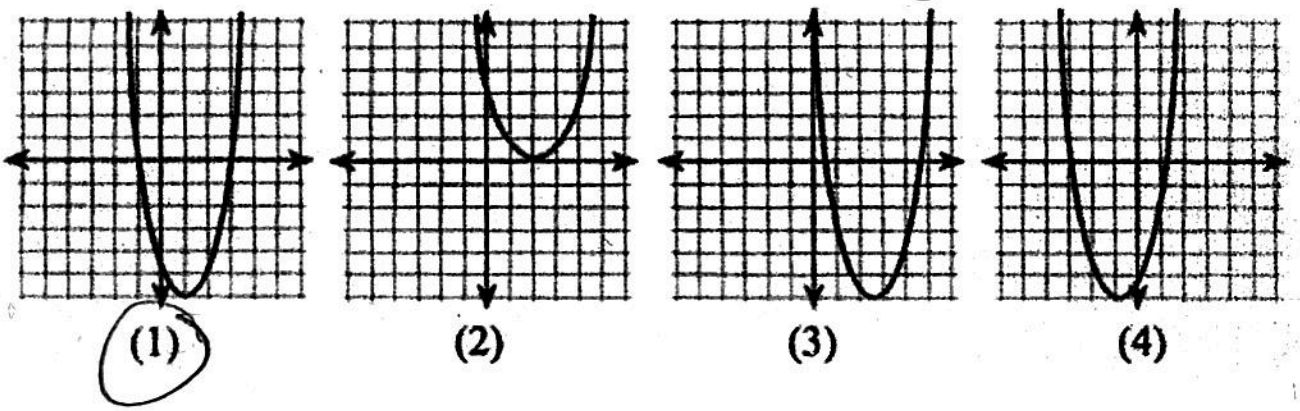
$g(x)=-8+16+3$

$g(x)=11$

TP (4, 11)

g(x) has larger maximum value

16. Which sketch is the correct graph for the function $y = x^2 - 5x - 6$? → y int

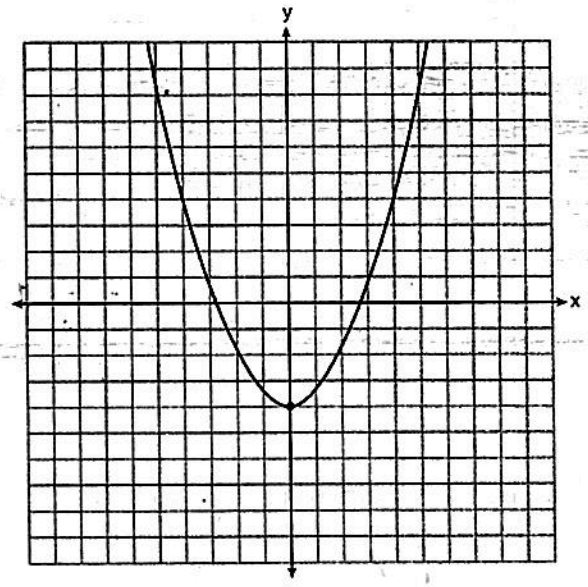


17. Each time Juanita bowls, her score increases by 5% of her previous score. If her initial score is represented by a, which equations shows this relationship?

a) $y = a(1.5)^x$ b) $y = a(1.05)^x$ c) $y = 0.05^x$ d) $y = a(0.5)^x$

$(1+r)$ $.05 = 5\%$.

18. Ryan is given the graph of the function $y = \frac{1}{2}x^2 - 4$. He wants to find the zeros of the function, but is unable to read them exactly from the graph.



a) Find the zeros in simplest radical form.
(hint: use a specific formula)

a) $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \dfrac{-0 \pm \sqrt{(0)^2 - 4(\frac{1}{2})(-4)}}{2(\frac{1}{2})}$

$x = \dfrac{0 \pm \sqrt{8}}{1}$

$x = +\sqrt{8}$ $\quad x = -\sqrt{8}$

$\sqrt{4}\sqrt{2}$ $\quad -\sqrt{4}\sqrt{2}$

$x = 2\sqrt{2}$ $\quad x = -2\sqrt{2}$

19. What is the slope and y intercept of: $x-3y=-15$?

$-x \quad -x$

$\frac{-3y}{-3} = \frac{-x}{-3} + \frac{15}{-3}$

$y = \frac{1}{3}x + 5$

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

$b = 5$

20. What is the order, from narrowest to widest graph, of the quadratic function $f(x)=-10x^2$, $f(x)=2x^2$, *and* $f(x)=0.5x^2$?

a >1 = narrow

(1) $f(x) = -10x^2, f(x) = 2x^2$, and $f(x) = 0.5x^2$

(2) $f(x) = 2x^2, f(x) = -10x^2$, and $f(x) = 0.5x^2$

(3) $f(x) = 0.5x^2, f(x) = 2x^2$, and $f(x) = -10x^2$

(4) $f(x) = 0.5x^2, f(x) = -10x^2$, and $f(x) = 2x^2$

21. 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

22. What is the difference when $2x^3+x-5$ is subtracted from $6x^3-x^2+4x+8$?

$(6x^3 - x^2 + 4x + 8) - (2x^3 + x - 5)$

$6x^3 - x^2 + 4x + 8 - 2x^3 - x + 5$

$14x^3 - x^2 + 3x + 13$