Name: Key

Practice Test #2 – Chapter 9
Intermediate Algebra – M120

Instructions: *All work must be shown in order to receive all points for all questions so practice showing all work. Practice* ***boxing your final answer****. Any answer that is a fraction must be in lowest terms and as mixed number for full credit. Since you can use a 5x8 notecard on the test use your notecard to practice or make one based on the problems you got wrong. Happy studying!*

1. Use the function to answer the questions that follow: $f(x) = {}^{1}/_{2}(x-1)^2 - 9$

a) Give the vertex of the parabola as an ordered pair: $(1, -9)$

b) Give the x-intercepts' approximate values as ordered pairs: $(-3.2, 0)$ $(5.2, 0)$
Round to the nearest tenth. Give as simplified radicals & then

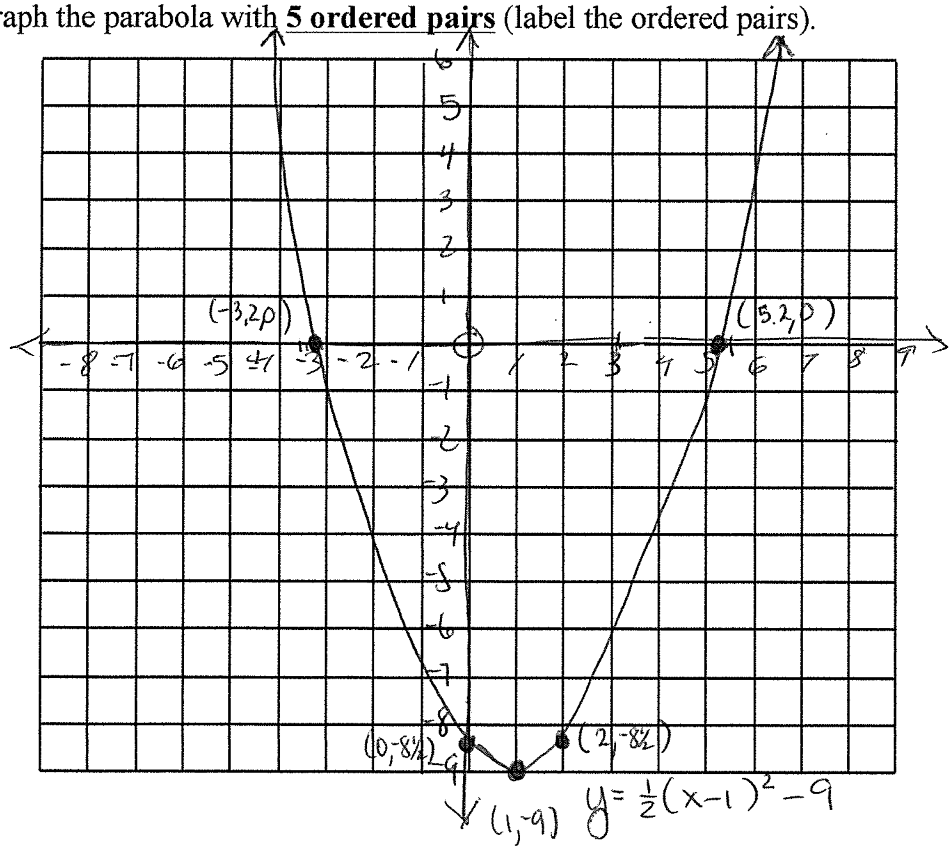
$$\frac{1}{2}(x-1)^2 - 9 = 0 \Rightarrow \frac{1}{2}(x-1)^2 = 9 \Rightarrow (x-1)^2 = 18$$

$$\Rightarrow x - 1 = \pm\sqrt{18} \Rightarrow x = 1 \pm 3\sqrt{2} \qquad 1 \pm 4.2$$

c) Give the y-intercept of the parabola as an ordered pair: $(0, -8.5)$

$$\frac{1}{2}(0-1)^2 - 9 = \frac{1}{2}(1) - 9 = 0.5 - 9 = -8.5$$

d) Graph the parabola with **5 ordered pairs** (label the ordered pairs).



2. The number of households (in millions) that own RV's, dependent upon the number of years since 1980, are modeled using the following function.

$$f(t) = 0.0085t^2 - 0.16t + 6.48$$

For this model, in what year will the fewest households own recreational vehicles? Show all work in getting your answer.

Finding minimum time which is t of vertex

$$t = \frac{-(-0.16)}{2(0.085)} = 1.88$$

In late 1981 the fewest R.V. households will exist

3. Solve the following quadratic using the **square root property**. $2(x-4)^2 + 5 = 27$

*Give an exact answer in its most simplified form.

$$-5 \quad -5$$

$$\frac{2(x-4)^2}{2} = \frac{22}{2} \Rightarrow \sqrt{(x-4)^2} = \pm\sqrt{11}$$

$$x - 4 = \pm\sqrt{11}$$

$$\boxed{x = 4 \pm \sqrt{11}}$$

4. Solve the following quadratic using the **quadratic formula**. $5x^2 - 4x = 3$

Make sure your answer is simplified, but exact.

$$76 = 2 \cdot 38 = 2 \cdot 2 \cdot 19$$

$$5x^2 - 4x - 3 = 0$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(-3)}}{2(5)} = \frac{4 \pm \sqrt{76}}{10}$$

$$16 + 60$$

$$= \frac{4 \pm 2\sqrt{19}}{10} = \frac{\cancel{2}(2 \pm \sqrt{19})}{\cancel{10}\,5} = \frac{2 \pm \sqrt{19}}{5}$$

5. Solve the following quadratic using the **zero product property**. $3x^2 = 5x - 2$

***Hint**: Factoring*

$$3x^2 - 5x + 2 = 0$$

$$(3x + 1)(x - 2) = 0$$

$$3x + 1 = 0 \qquad x - 2 = 0$$

$$3x = -1 \qquad \boxed{x = 2}$$

$$\boxed{x = -\tfrac{1}{3}}$$

6. Solve the following quadratic by **completing the square**. $3x^2 - 6x - 33 = 0$

Give an exact, simplified solution.

$$\frac{3(x^2-2x-11)}{3} = \frac{0}{3}$$

so

$$\left(\frac{1}{2}\cdot 2\right)^2 \qquad 1^2 = 1$$

$$x^2 - 2x + 1 = 11 + 1$$

$$(x-1)^2 = 12$$

$$x - 1 = \pm\sqrt{12}$$

$$x - 1 = \pm 2\sqrt{3}$$

$$x = 1 \pm 2\sqrt{3}$$

7. Find all values for: $f(x) = x^2 + 8x + 11$ where $f(x) = 20$

$$x^2 + 8x + \underset{-20}{11} = \underset{-20}{20}$$

$$x^2 + 8x - 9 = 0$$

$$(x+9)(x-1) = 0$$

$$x + 9 = 0 \qquad x - 1 = 0$$

$$\boxed{x = -9} \quad \boxed{x = 1}$$

8. Find an equation of a parabola that contains the 3 points.
(1,4), (-1,-2) and (2,13)

$$a(1)^2 + b(1) + c = 4 \Rightarrow a + b + c = 4$$

$$a(-1)^2 + b(-1) + c = -2 \Rightarrow a - b + c = -2$$

$$a(2)^2 + b(2) + c = 13 \Rightarrow 4a + 2b + c = 13$$

$$a + b + c = 4$$
$$a - b + c = -2$$
$$2a + 2c = 2$$

$$2a - 2b + 2c = -4$$
$$4a + 2b + c = 13$$
$$6a + 3c = 9$$

$$6a + 6c = 6$$
$$-6a - 3c = -9$$
$$3c = -3$$
$$c = -1$$

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

$$\Rightarrow 2a + 2(-1) = 2 \Rightarrow 2a = 4 \Rightarrow a = 2 \Rightarrow 2 + b - 1 = 4$$

$$b + 1 = 4$$

$$b = 3$$

9. Give the discriminant of the following & tell me what the discriminant value means:
$f(x) = 6x^2 - 48x + 96$

$$(-48)^2 - 4(6)(96) = 2304 - 2304 = 0$$

This means that the parabola has only 1 x-intercept or only 1 real solution.

10. Given the following three ordered pairs, find the equation (linear or quadratic) that will model the data most accurately. Show all work. For a linear equation end in slope-intercept form. For a quadratic end in vertex form.

a) (-3, -2), (-5, 6) & (-1, 6)

$\frac{6-(-2)}{-5-(-3)} = \frac{8}{-2}$ $\quad \frac{6-6}{-1-(-5)} = \frac{0}{4} = 0$

Different rates of change ∴ not linear

$\left(\frac{-5+-1}{2}, \frac{6+6}{2}\right) = (-3, 6)$

x of vertex ∴ (-3,-2) is vertex.

midpt of 2 symmetric pts.

$y = a(x+3)^2 - 2$ $\quad 6 = a(-1+3)^2$

$\frac{8}{4} = \frac{a(2)^2}{4}$

$a = 2$

$\boxed{y = 2(x+3)^2 - 2}$

b) $(1, \cancel{2})$ 3, $(3, \cancel{6})$ 7 & $(-1, \cancel{-2})$ -1

$\frac{6-2}{2} = \frac{4}{2} = 2$ $\quad \frac{6-(-2)}{3+1} = \frac{8}{4} = 2$

constant slope ∴ linear

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

$y - 3 = 2x - 2$

$+3 \qquad +3$

$\boxed{y = 2x + 1}$

11. The following quadratic models the path of a projectile after it is launched. The dependent variable represents the projectile's height in meters at time t in seconds.

space

$$h(t) = -4.9t^2 + 196t - 29.4$$

a) How long will it take the projectile to reach its maximum height? Round to 1 decimal. if necessary.

Vertex's x-coordinate

$\frac{-(196)}{2(-4.9)} = 20$ sec

b) What is the maximum height that the projectile will reach? Round to 1 decimal. if necessary

vertex's y-coordinate

$h(20) = -4.9(20)^2 + 196(20) - 29.4 = -1960 + 3920 - 29.4$

$= \boxed{1930.6 \text{ m}}$

c) How long will it take for the projectile ~~reach~~ hit the ground? Round to 1 decimal. if necessary

(after reaching it maximum height.

$h(t) = 0$

$-4.9t^2 + 196t - 29.4 = 0 \Rightarrow -4.9(t^2 - 40t + 6) = 0$

$t = \frac{-(-40) \pm \sqrt{40^2 - 4(1)(6)}}{2(1)} = \frac{40 \pm \sqrt{1576}}{2}$

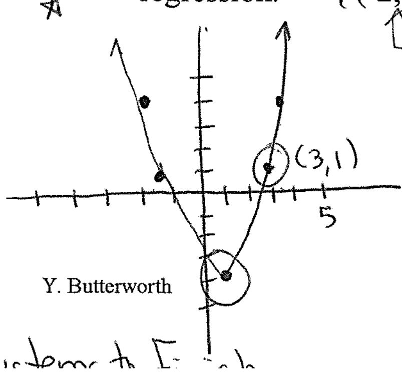
$= \frac{40 \pm 39.7}{2}$

$= \frac{79.7}{2}$ or $\cancel{\frac{0.3}{2}}$

$= 39.85$

≈ 39.9 sec

12. Use a by-hand method to model the data and then use your calculator to model using regression. { (-2, 4), (-1.5, 0.5), (1, -4), (3, 1), (3.5, 4)}



$y = a(x-1)^2 - 4$

$1 = a(3-1)^2 - 4$

$5 = a2^2$

$a = \frac{5}{4} \Rightarrow \boxed{y = 1.25(x-1)^2 - 4}$

$x^2 - 2x + 1$

-2.75

Regression

$\boxed{y = 1.07x^2 - 1.56x - 3.74}$

Need Systems to F[illegible]

12. Use a by-hand method to model the data and then use your calculator to model using regression. $\{(-2, 4), (-1.5, 0.5), (1, -4), (3, 1), (3.5, 4)\}$

See bottom of previous page

13. Solve the system using elimination and answer as an ordered triple:

$$\begin{aligned} 2x - 4y + 7z &= 24 \\ 4x + 2y - 3z &= 4 \\ 3x + 3y - z &= 4 \end{aligned}$$

$\boxed{(3, -1, 2)}$

18 10

$2 \cdot 3^2$ $2 \cdot 5$

$2 \cdot 9 \cdot 5$
$= 90$

① $-4x + 8y - 14z = -48$
$4x + 2y - 3z = 4$
$9(10y - 17z = -44)$

② $-6x + 12y - 21z = -72$
$6x + 6y - 2z = 8$
$-5(18y - 23z = -64)$

③ $90y - 153z = -396$
$-90y + 115z = 320$
$-38z = -76$
$z = 2$

④ $10y - 17(2) = -44$
$10y - 34 = -44$
$+34 \quad +34$
$10y = -10$
$y = -1$

⑤ $2x - 4(-1) + 7(2) = 24$
$\Rightarrow 2x + 4 + 14 = 24 \Rightarrow 2x + 18 = 24 \Rightarrow 2x = 6 \Rightarrow x = 3$

14. Solve the system using elimination and answer as an ordered pair.

$$\begin{aligned} -4\,(2x + y &= 6) \\ 3x + 4y &= 4 \end{aligned}$$

$-8x - 4y = -24$
$3x + 4y = 4$
$-5x = -20$
$\frac{-5x}{-5} = \frac{-20}{-5}$

$x = 4$

$2(4) + y = 6$
$-8 \quad -8$
$y = -2$

$\boxed{(4, -2)}$