Name: _____

1. If $p(t) = -2(t-3)(t+2)$ is quadratic, then it can be written as

   $p(t) = \underline{\ -2\ }\, t^2 + \underline{\ 2\ }\, t + \underline{\ 12\ }$. If $p(t)$ is not quadratic, enter "DNE" for each of the blanks.

   $-2(t-3)(t+2)$
   $-2(t^2-t-6)$
   $-2t^2+2t+12$

2. The height of a baseball in feet t seconds after it has been hit is given by

   $y = 2 + 35t - 16t^2$.

   a) What is the height of the ball 0.2 seconds after it was hit?
   b) When does the ball hit the ground? (If necessary, round your answer to three decimal places)

   $y = 2 + 35(.2) - 16(.2)^2$
   $= 2 + 7 - 16(.04)$
   $= 9 - .64$
   $\boxed{y = 8.36\ ft}$

   $0 = 2 + 35t - 16t^2$
   $0 = -16t^2 + 35t + 2$
   $\dfrac{-35 \pm \sqrt{35^2 - 4(-16)(2)}}{2(-16)}$
   $\dfrac{-35 \pm \sqrt{1225 + 128}}{-32}$

   $\dfrac{-35 \pm \sqrt{1353}}{-32}$
   $t = 2.243\ seconds$

3. Let $f(x)$ be a quadratic function which has y-intercept 30 and has zeros at $x = -2$ and $x = 5$. Then $f(x) = \underline{\ -3\ }\, x^2 + \underline{\ 9\ }\, x + \underline{\ 30\ }$. (Solve algebraically.)

   $y = a(x+2)(x-5)$
   $30 = a(0+2)(0-5)$
   $30 = -10a$
   $-3 = a$

   $y = -3(x+2)(x-5)$
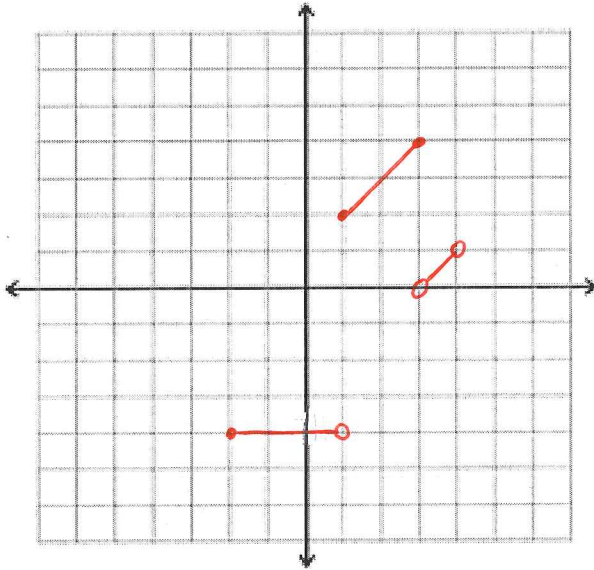 $= -3(x^2 - 3x - 10)$
   $= -3x^2 + 9x + 30$

4. Find a formula for the quadratic function which has only one zero at $x = 3$ and contains the point $(2, -3)$

   $(3, 0)$ VERTEX

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

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

5. Graph the function: $f(x) = \begin{cases} -4, & -2 \le x < 1 \\ x+1, & 1 \le x \le 3 \\ x-3, & 3 < x < 4 \end{cases}$

6. Find a formula for the quadratic function whose graph has axis of symmetry $x = 4.5$, y-intercept at $y = 7$, and contains the point $(3, -47)$.

$y = a(x - 4.5)^2 + K$

$7 = a(-4.5)^2 + K$ $-47 = a(3 - 4.5)^2 + K$

$7 = 20.25a + K$ $-47 = a(-1.5)^2 + K$

$7 - 20.25a = K$ $-47 = 2.25a + K$

$-47 - 2.25a = K$

$7 - 20.25a = -47 - 2.25a$

$54 = 18a$

$3 = a$

$K = -47 - 2.25(3)$

$K = -47 - 6.75$

$K = -53.75$

$y = 3(x - 4.5)^2 - 53.75$

7. Which of the following parabolas have a vertex of $(6, -6)$?

(A) $y = -3(x - 6)^2 - 6$
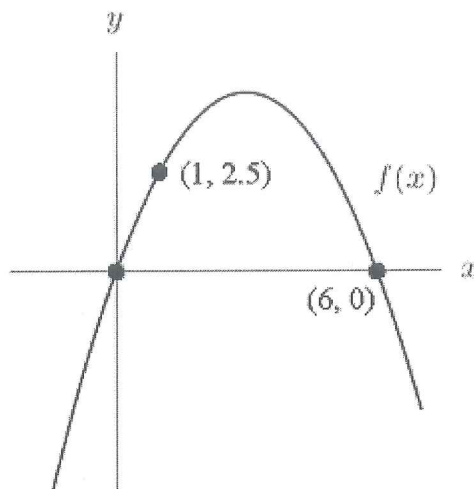
B) $y = 4(x + 6)^2 + 6$

C) $y = -8(x + 6)^2 - 6$

(D) $y = 6x^2 - 72x + 210$

E) $y = 4x^2 + 48x + 150$

D.) $6(x^2 - 12x \quad) + 210$

$6(x^2 - 12x + 36) + 210 - 216$

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

E.) $4(x^2 + 12x \quad) + 150$

$4(x^2 + 12x + 36) + 150 - 144$

$4(x + 6)^2 + 6$

8. The formula for the following parabola is $f(x) = a(x-h)^2 + k$, where $a = \underline{-\frac{1}{2}}$, $h = \underline{3}$, and $k = \underline{4.5}$.

(Graph showing a downward parabola with labeled points (1, 2.5), (6, 0), and axis labels y, x, and curve labeled $f(x)$)

Handwritten work:
$$y = a(x-6)(x-0)$$
$$2.5 = a(1-6)(1)$$
$$2.5 = a(-5)$$
$$-\frac{1}{2} = a$$
$$y = -\frac{1}{2}(x-6)(x)$$
$$= -\frac{1}{2}(x^2 - 6x \quad)$$
$$= -\frac{1}{2}(x^2 - 6x + 9) + 4.5$$
$$= -\frac{1}{2}(x-3)^2 + 4.5$$

Note: Figure is not necessarily drawn to scale.

9. What is the equation of the parabola that is concave down, has vertex $(-1, 5)$ and contains the origin.
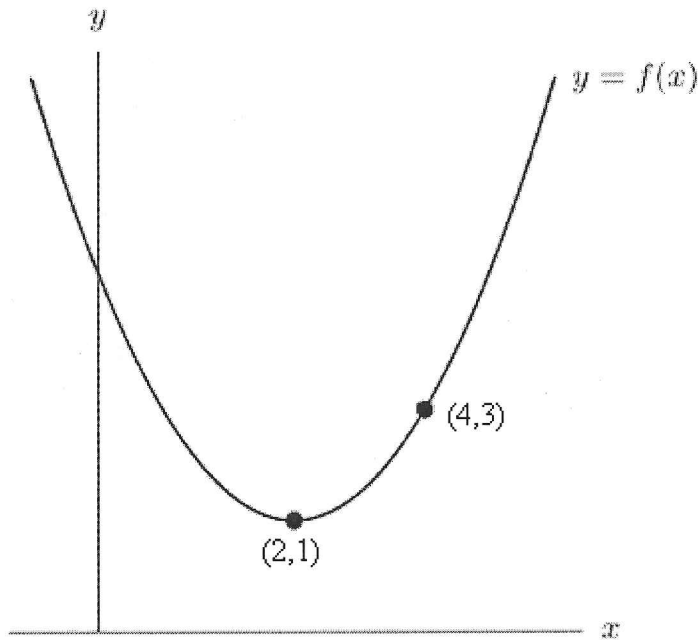
$$y = a(x+1)^2 + 5$$
$$0 = a(0+1)^2 + 5$$
$$0 = 1a + 5$$
$$-5 = a$$

$$y = -5(x+1)^2 + 5$$

10. Find the vertex and azis of symmetry algebraically for the function $r(t) = 5t^2 - 50t + 130$.

$$5(t^2 - 10t \quad) + 130$$
$$5(t^2 - 10t + 25) + 130 - 125$$
$$5(t-5)^2 + 5$$

VERTEX: $(5, 5)$

AOS: $X = 5$

11. The following figure gives the graph of $y = f(x)$, a quadratic function with vertex (2, 1).
The formula for $f(x)$ is $y = a(x-b)^2 + c$, where $a = \underline{\frac{1}{2}}$, $b = \underline{2}$, and $c = \underline{1}$.

y

$y = f(x)$

(4,3)

(2,1)

x

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

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

12. Suppose that $f(x)$ is linear with an x-intercept of 2 and a y-intercept of 3. If
$f(x) = b + mx$, then $b = \underline{3}$ and $m = \underline{-\frac{3}{2}}$.

$(2,0) \quad (0,3)$

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

$m = \frac{3-0}{0-2}$
$m = \frac{3}{-2}$
$m = -\frac{3}{2}$

13. If $f(5) > f(6.2)$, then the function must be a decreasing function.
   A) True
   B) False   True if linear, but not if a parabola

increasing   decreasing

Page 4