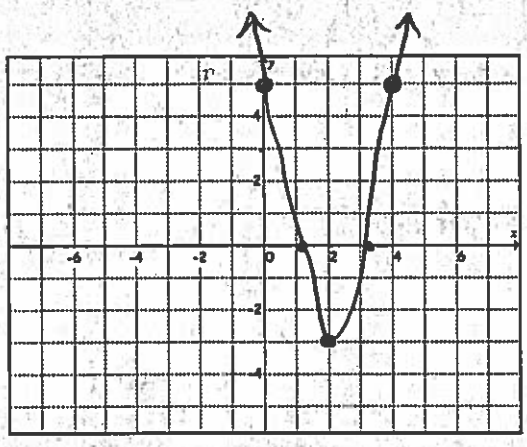
Mathematics 20-1
Chapter 3: Quadratic Functions
Final Exam Review Assignment

Name: Answers
Date: _____

Vertex Form: $y = a(x-p)^2 + q$ **Standard Form:** $y = ax^2 + bx + c$

1. Graph the function $y = 2x^2 - 8x + 5$ then identify the coordinates of its vertex, the equation of the axis of symmetry, direction of opening, maximum or minimum value, domain, range, y-intercept, and the x-intercepts. Round to the nearest tenth where rounding is necessary.



1) vertex $(2,-3)$
$x = \frac{8}{2(2)} = \frac{8}{4} = 2$
$y = 2(2)^2 - 8(2) + 5$
$y = 8 - 16 + 5$
$y = -8 + 5$
$y = -3$.

2) A.o.S. $x = 2$.

3) opens up.

4) min value $y = -3$. $x = 3.2$, $x = 0.78$

5) D: $x \in \mathbb{R}$

6) R: $y \geq -3$, $y \in \mathbb{R}$

7) y-int = 5

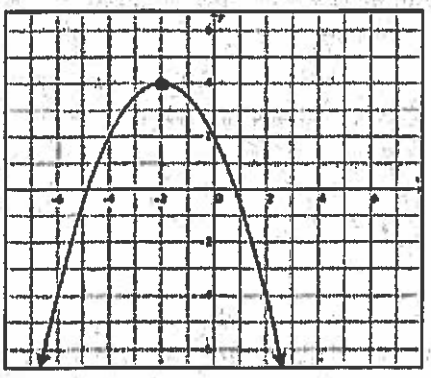
8) x-int
$2x^2 - 8x + 5 = 0$
$x = \frac{8 \pm \sqrt{64 - 4(2)(5)}}{4}$
$x = \frac{8 \pm \sqrt{24}}{4}$

2. Determine a quadratic function in vertex form that has its vertex at (7, 1) and passes through the point (4, 2).

$y = a(x-7)^2 + 1$
$2 = a(4-7)^2 + 1$
$2 = a(-3)^2 + 1$
$2 - 1 = 9a$
$1 = 9a$
$\frac{1}{9} = a$

$\therefore y = \frac{1}{9}(x-7)^2 + 1$

3. Determine a quadratic function in vertex form for the parabola graphed below.

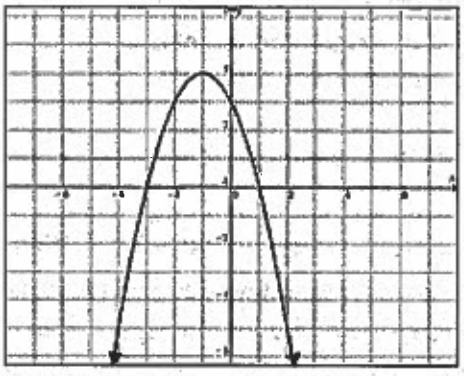


vertex $(-2, 4)$
point $(0, 2)$

$y = a(x-p)^2 + q$
$y = a(x+2)^2 + 4$
$2 = a(0+2)^2 + 4$
$2 - 4 = 4a$
$-2 = 4a$
$\frac{-2}{4} = \frac{4a}{4}$
$a = -\frac{1}{2}$.

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

4. For the graph, identify the following:



- the coordinates of the vertex $(-1, 4)$
- the equation of the axis of symmetry $x = -1$
- the x-intercepts $x = -3, x = 1$
- y-intercept $y = 3$
- the direction of opening down
- the maximum or minimum value max at $y = 4$
- the domain and range

D: $x \in \mathbb{R}$

R: $y \leq 4, y \in \mathbb{R}$

5. Write each function in vertex form by completing the square. Use your answer to identify the vertex of the function.

a) $y = x^2 + 10x + 21$

$y = (x^2 + 10x + 25) + 21 - 25$

$y = (x+5)^2 - 4.$

V $(-5, -4)$

b) $y = 2x^2 - 12x + 11$

$y = 2(x^2 - 6x) + 11$

$y = 2(x^2 - 6x + 9) + 11 - 18$

$y = 2(x-3)^2 - 7$

V $(3, -7)$

c) $y = -4x^2 + 8x + 1$

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

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

$y = -4(x-1)^2 + 5.$

V $(1, 5)$

6. The parabolic path of an aircraft used to simulate weightlessness can be represented by the quadratic function $h = -10t^2 + 300t + 9750$, where 'h' is the altitude of the aircraft, in metres, and 't' is the time, in seconds, since weightlessness was achieved.

a) Rewrite the function in vertex form.

$h = -10t^2 + 300t + 9750.$

$h = -10(t-15)^2 + 12000$

vertex $-\frac{300}{2(-10)} = \frac{300}{20} = 15$

$h = -10(15)^2 + 300(15) + 9750$

$h = 12000$

b) What is the maximum altitude reached by the aircraft and the number of seconds it takes the reach this maximum altitude?

maximum altitude $= 12000\,m$

time to reach it $= 15$ sec.