Math 2200 **Chapter 3 Review** **Name:** _____

15 **Part I:** **Multiple Choice. Write the correct answer in the space provided at the end of this section.**

1. Which describes the graph of $y = 3(x+4)^2 + 1$?

$a = 3 > 0$ opens up.

vertex $(-4, 1)$

(A) Vertex (-4,1) and opens up.

~~(B) Vertex (-4,1) and opens down.~~

(C) Vertex (4,-1) and opens up.

~~(D) Vertex (4, -1) and opens down.~~

2. What is the range of the quadratic function $y = -2x^2 + 12x - 14$?

Find q.

$p = \frac{-b}{2a} = \frac{-12}{2(-2)} = 3$ $a < 0$

$q = -2(3)^2 + 12(3) - 14 = 4$ so $y \mid y \le 4$

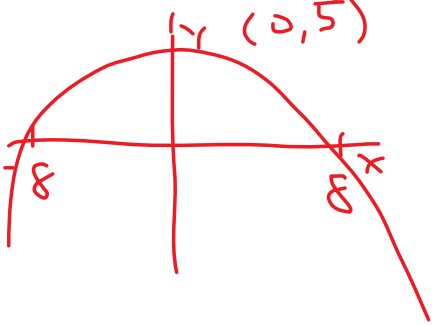
(A) $\{y | y \le -4, y \in R\}$

(B) $\{y | y \ge -4, y \in R\}$

(C) $\{y | y \le 4, y \in R\}$

(D) $\{y | y \ge 4, y \in R\}$

3. A quadratic function has a maximum height of 5 and x-intercepts at -8 and 8. What is the vertex?



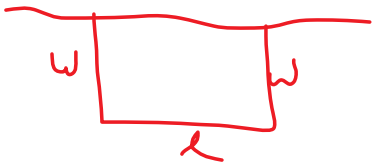
(A) (-5,0)

(B) (0,-5)

(C) (0,5)

(D) (5,0)

4. A lifeguard has 100 m of rope to enclose a rectangular swimming area. Which equation represents the maximum area of the enclosure if the lifeguard uses the beach as one side and the rope for the other three sides?



$2w + l = 100$

$A = l \cdot w$

$l = -2w + 100$

$A = (-2w + 100)w$

(A) $A = w(50 - w)$

(B) $A = w(50 - 2w)$

(C) $A = w(100 - w)$

(D) $A = w(100 - 2w)$

5. Which of the following quadratic functions has the most narrow parabola when compared to $y = x^2$?

The "larger" the a value, the more narrow the graph.

(A) $y = \frac{4}{3}(x-5)^2 - 2$

(B) $y = \frac{1}{2}(x-5)^2 - 2$

(C) $y = \frac{2}{7}(x-5)^2 - 2$

(D) $y = \frac{1}{5}(x-5)^2 - 2$

6. Which function has axis of symmetry $x = 2$?

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

$p = \frac{-(-12)}{2(3)} = 2$

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

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

(C) $y = 3x^2 - 12x + 4$

~~(D) $y = 3x^2 + 12x + 4$~~

7. The point $(2, 4)$ is on the graph of the quadratic equation $f(x) = -x^2 + bx + 12$. What is the value of b?

x y

$4 = -1(2)^2 + b(2) + 12 \rightarrow b = -2$

$4 = -4 + 2b + 12$

$4 + 4 - 12 = 2b$

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

(A) $-\frac{13}{2}$

(B) -6

(C) -2

(D) $\frac{3}{2}$

8. Which value of c makes $x^2 - 7x + c$ a perfect square?

$c = \left(\frac{b}{2}\right)^2$

$c = \left(\frac{-7}{2}\right)^2 = \frac{49}{4}$

(A) $\frac{7}{2}$

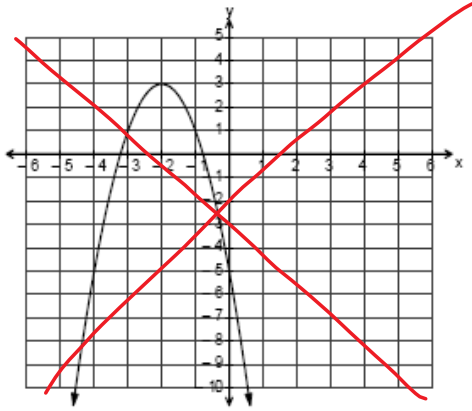
(B) $\frac{49}{4}$

(C) 7

(D) 49

9. Which graph represents $y = -2(x - 2)^2 - 3$?

(A)



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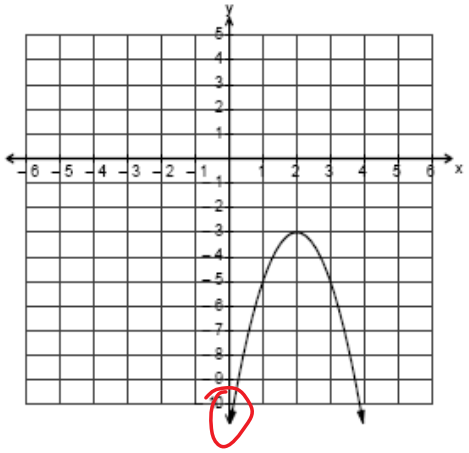

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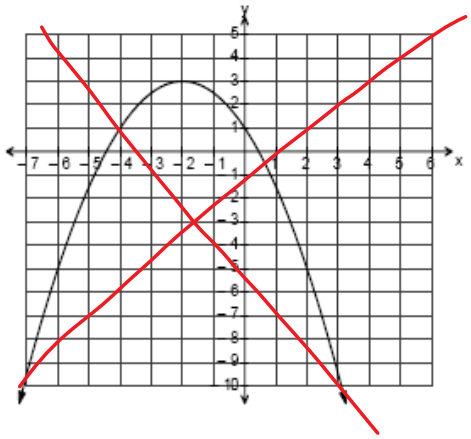

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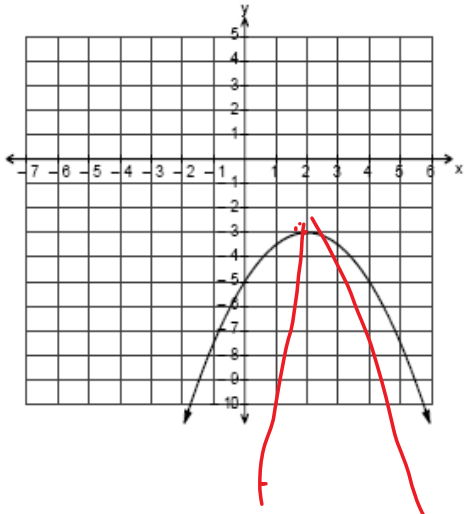


vertex $(2, -3)$

$y = -2(0-2)^2 - 3$

$y = -2(4) - 3$

$y = -8 - 3$

$y = -11$

10. What is the value of $\boldsymbol{a}$ in the function $y = ax^2 - 48x + 12$, if the axis of symmetry for the graph of the function is $x = 6$?

(A) -4

(B) -1

(C) 1

(D) 4

$p = -\frac{b}{2a}$ ← p

$\frac{6}{1} = \frac{-(-48)}{2a}$

$\frac{12a}{12} = \frac{48}{12}$

$a = 4$

11. What is the domain of the quadratic function $f(x) = -3x^2 + 12x - 1$?

(A) $\{x|x \in R\}$ ← always.

(B) $\{x|x \geq -1, x \in R\}$

(C) $\{x|x \geq 2, x \in R\}$

(D) $\{x|x \geq 11, x \in R\}$

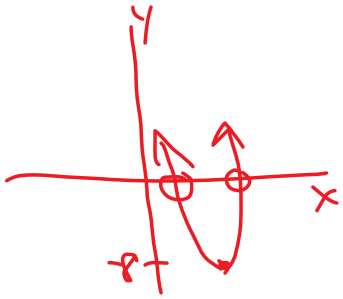
12. A quadratic function has a minimum value at -8 and $a > 0$. How many x-intercepts are there?

(A) 0

(B) 1

(C) 2

(D) 3



13. What is the vertex form of $y = 3x^2 - 12x + 1$?

(A) $y = 3(x - 2)^2 + 13$

(B) $y = 3(x - 2)^2 - 11$

(C) $y = 3(x + 2)^2 + 13$

(D) $y = 3(x + 2)^2 + 11$

$y = 3(x^2 - 4x + 4) + 1 - 12$

$y = 3(x - 2)^2 - 11$

14. The quadratic function, $f(x) = -2x^2 + 8x - 5$, has an axis of symmetry of $x = 2$. What is the maximum value?

(A) -29

(B) -5

(C) 2

(D) 3

$q = f(2) = -2(2)^2 + 8(2) - 5$

$= 3$

15. Jimmy sells makes and sells hacky sacks. The material for each hacky sack costs $3.00 and he has been selling about 10 per day for $8.00 each. He has been thinking about raising the price, so he takes a survey and finds that for every $2 increase in price he would lose three sales a day. What equation could be used to determine the hacky sack price that results in the greatest revenue?

(A) $y = (5 - 2n)(10 + 3n)$

(B) $y = (5 + 2n)(10 - 3n)$

(C) $y = (5 - 3n)(10 + 2n)$

(D) $y = (5 + 3n)(10 - 2n)$

$P = (\text{price})(\#\text{sold})$

$P = (5 + 2n)(10 - 3n)$

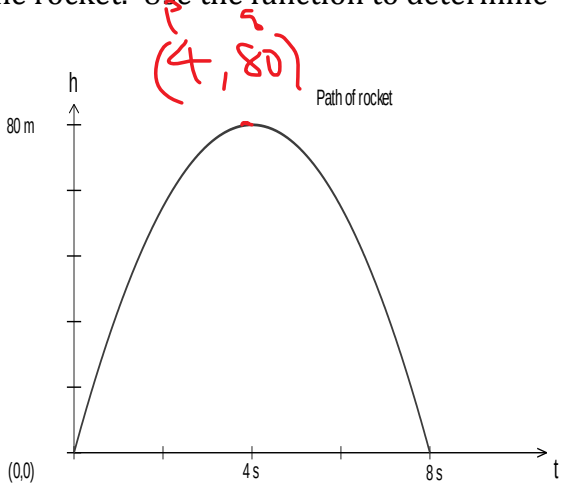
$n = \#$ of \$1 increments.

Answers to multiple choice.

1.___	**2.___**	**3.___**	**4.___**	**5.___**
6.___	**7.___**	**8.___**	**9.___**	**10.___**
11.___	**12.___**	**13.___**	**14.___**	**15.___**

26 **Part II:** **Constructed Response. Answer each question in the space provided. Show all workings.**

4 16. A toy rocket is launched into the air and reaches a maximum height of 80 m after a time of 4 seconds. If the rocket lands after 8 seconds, determine the quadratic function that describes the flight path of the rocket. Use the function to determine the height of the rocket at 6.5 seconds.



$y = a(x-p)^2 + q$

$0 = a(0-4)^2 + 80$

$\frac{-80}{16} = \frac{16a}{16}$

$a = -5$

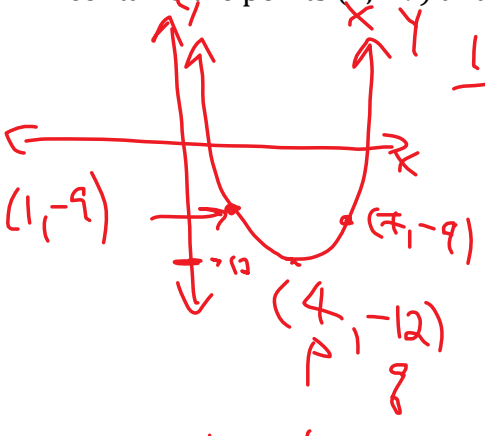
$y = -5(x-4)^2 + 80$

$y = -5(6.5-4)^2 + 80$

$y = 48.75$

The rocket is 48.75 m high @ 6.5 s.

4 17. Determine the equation, in the form $y = a(x-p)^2 + q$, of the quadratic function that contains the points $(1, -9)$ and $(7, -9)$ and has a minimum value of -12.



$\frac{1+7}{2} = 4$

$-9 = a(1-4)^2 - 12$

$-9 + 12 = 9a$

$\frac{3}{9} = \frac{9a}{9}$

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

$y = \frac{1}{3}(x-4)^2 - 12$

3 18. A baseball is hit and follows a parabolic path described by the function $h(t) = -3t^2 + 12t + 1$, where t is time in seconds after the ball is hit and $h(t)$ is the height of the ball above ground in metres. Algebraically determine the maximum height reached by the ball and the time it takes the ball to reach its maximum height.

$p = \frac{-b}{2a} = \frac{-12}{2(-3)} = 2$

$q = -3(2)^2 + 12(2) + 1 = 13$

The ball is at a max. height of 13m @ 2s.

3 19. Convert the following function from standard from to vertex form by completing the square:

$$f(x) = -6x^2 - 48x + 29$$

$y = -6(x^2 + 8x + 16) + 29 + 96$

$y = -6(x + 4)^2 + 125$

4 20. If the points $(-2, 6)$ and $(1, -6)$ are on the graph of the quadratic function $f(x) = -3x^2 + bx + c$, determine the values of b and c.

$6 = -3(-2)^2 + b(-2) + c$

$6 = -12 - 2b + c$

① $-2b + c = 18$

$-6 = -3(1)^2 + b(1) + c$

$-6 = -3 + b + c$

② $b + c = -3$

① $b + c = -3$

② $-2b + c = 18$

$3b = -21$

$b = -7$

Sub $b = -7$ into ①

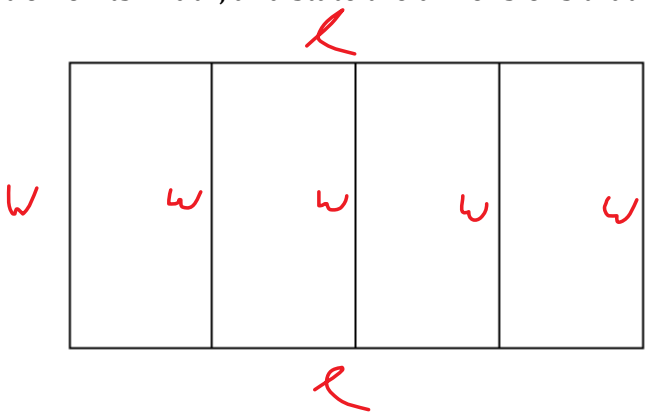
$-7 + c = -3$

$c = -3 + 7$

$c = 4$

$y = -3x^2 - 7x + 4$

4 21. A farmer uses 400 m of fencing to create a rectangular pig pen and to divide it into four regions of equal area as shown. Algebraically determine the function which gives the area of the pig pen as a function of its width, and state the dimensions that produce maximum area.



① $2\ell + 5w = 400$

② $A = \ell \cdot w$

$\frac{2\ell}{2} = \frac{-5w + 400}{2}$

$\ell = -2.5w + 200$

$A = (-2.5w + 200)w$

$A = -2.5w^2 + 200w$

$p = -\frac{b}{2a} = \frac{-200}{2(-2.5)} = 40$

So $w = 40m$

$\ell = -2.5(40) + 200$

$\ell = 100m$

$A = (40m)(100m) = 4000m^2$