

Part A: Multiple Choice. (14 marks)

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Place the letter of the correct response in the space provided. Please use CAPITAL letters.

1. What is the equation of the axis of symmetry of the function $y = -5(x-4)^2 + 3$? 1. D
x-coord vertex

- A) $x = -5$ B) $x = -4$ C) $x = 3$ D) $x = 4$

2. What is the range of the function $y = 5(x+1)^2 - 4$?

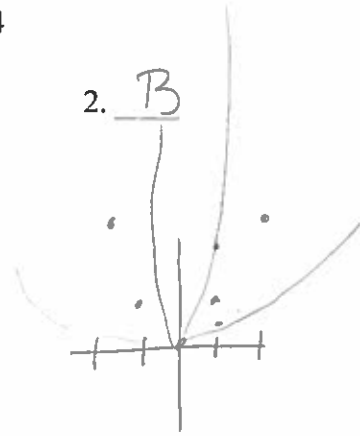
- A) $\{y / y \leq -4, y \in R\}$
 B) $\{y / y \geq -4, y \in R\}$
 C) $\{y / y \leq 4, y \in R\}$
 D) $\{y / y \geq 4, y \in R\}$

$V(-1, -4)$



$y \geq -4$

2. B



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

- A) opens up, wider, translated 2 unit left and 4 units up
 B) opens up, narrower, translated 2 unit right and 4 units up
 C) opens up, wider, translated 2 unit right and 4 units up
D) opens up, narrower, translated 2 unit left and 4 units up

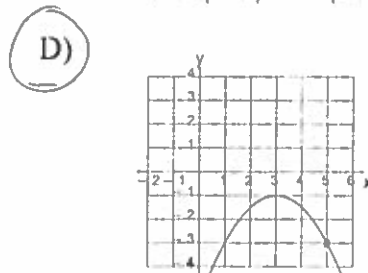
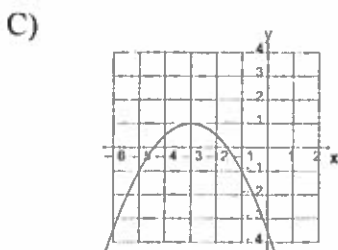
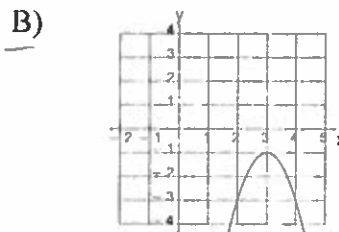
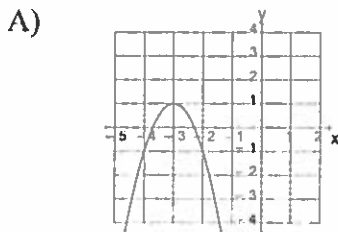
$a > 1$ narrow
 $-1 < a < 1$ wide

3. D

4. Which graph represents $y = -\frac{1}{2}(x-3)^2 - 1$?

$V(3, -1)$

4. D



5. What is the standard form of the quadratic function $f(x) = 3(x-1)^2 - 25$? 5. B

A) $f(x) = 3x^2 - 3x - 11$

B) $f(x) = 3x^2 - 6x - 22$

C) $f(x) = 3x^2 + 6x - 22$

D) $f(x) = 3x^2 - 6x - 11$

$$3(x^2 - 2x + 1) - 25$$

$$3x^2 - 6x - 22$$

6. What is the y-intercept of the function $y = -\frac{1}{2}(x-4)^2 + 5$? 6. A

A) -3 *sub x=0*

B) -4

C) 5

D) 13

$$y = -\frac{1}{2}(0-4)^2 + 5$$

$$y = -\frac{1}{2}$$

$$= -8 + 5$$

7. Which quadratic function when graphed will have 1 x-intercept? 7. D

A) $y = -2(x-1)^2 + 4$ *V(1, 4)*

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

C) $y = -2x^2 + 4$

D) $y = 2(x-1)^2 + 0$



8. The vertex of a parabola is located at $(-5, 6)$. If the parabola has a y-intercept of 231, which quadratic function represents the parabola? 8. B

A) $f(x) = 9(x-5)^2 + 6$

B) $f(x) = 9(x+5)^2 + 6$

C) $f(x) = -9(x+5)^2 + 6$

D) $f(x) = 9(x-5)^2 - 6$

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

$$y = a(x+5)^2 + 6$$

$$231 = a(0+5)^2 + 6$$

$$231 = 25a + 6$$

$$-6 \quad -6$$

$$\frac{225}{25} = \frac{25a}{25}$$

$$9 = a$$

(0, 231)
x, y

9. The path of a volleyball is given by $h = -\frac{1}{2}t^2 + 4t + 3$ where t is time in seconds and h is height in metres. At what time, in seconds, does the ball reach its maximum height?

9. B

- A) 3
B) 4
C) 10.5
D) 11

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

10. What value of 'c' would make $y = x^2 + \frac{3}{4}x + c$ a perfect square?

$$x^2 + bx + \frac{a}{4}$$

A) $\frac{9}{4}$

B) $\frac{3}{2}$

C) $\frac{3}{8}$

D) $\frac{9}{64}$

10. D

$$c = \left(\frac{\frac{1}{2} \cdot \frac{3}{4}}{2}\right)^2 = \left(\frac{\frac{3}{8}}{2}\right)^2 = \frac{9}{64}$$

11. What is the vertex form of the quadratic function $y = x^2 - 14x + 15$?

A) $y = (x - 7)^2 - 34$

B) $y = (x - 7)^2 + 64$

C) $y = (x - 49)^2 + 181$

D) $y = (x - 49)^2 + 211$

$$(x^2 - 14x + 49) + 15 - 49$$

$$(x - 7)^2 - 34$$

11. A

12. A theatre seats 400 people per show and is currently sold out with a ticket price of \$10. A survey shows that for every \$1 per ticket price increase, 25 fewer tickets will be sold. Which function models this situation?

12. B

A) $R = (400x - 25)(10 + x)$

B) $R = (400 - 25x)(10 + x)$

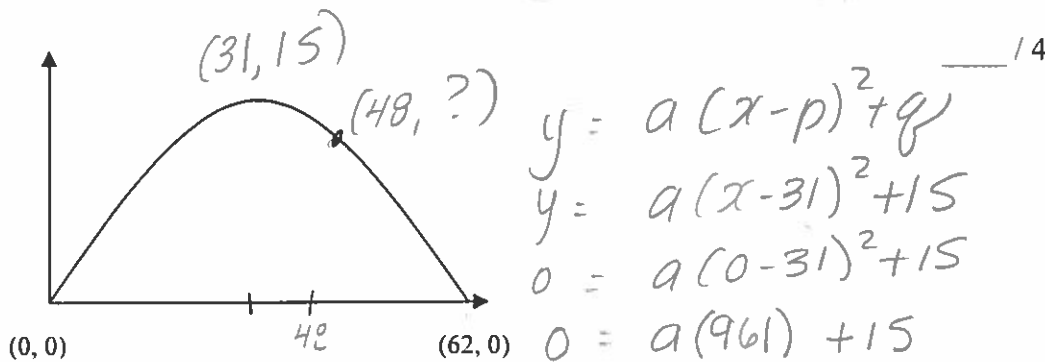
C) $R = (400 - x)(10 + 25x)$

D) $R = (400x - 25)(10 + 25x)$

Part B: Long Answer Questions. Show ALL workings to receive FULL credit.

13. A soccer ball lying on the ground is kicked downfield and hits the ground 62 m away. The maximum height reached by the ball is 15 m.

- a) Algebraically determine the quadratic function that models the height of the ball.
b) Use the function to determine the height of the ball when it is 48 m downfield.



$$\begin{aligned}
 \text{a) } y &= \frac{-15}{961} (x-31)^2 + 15 \\
 &= \frac{-15}{961} (48-31)^2 + 15 \\
 &= \frac{-15}{961} (17)^2 + 15 \\
 &= -4.5 + 15 = 10.5
 \end{aligned}$$

$$\begin{aligned}
 y &= a(x-p)^2 + q \\
 y &= a(x-31)^2 + 15 \\
 0 &= a(0-31)^2 + 15 \\
 0 &= a(961) + 15 \\
 -15 &= 961a \\
 a &= \frac{-15}{961}
 \end{aligned}$$

14. Using the process of completing the square, convert $f(x) = -2x^2 + 12x - 5$ to vertex form.

$$\begin{aligned}
 y &= (-2x^2 + 12x) - 5 \\
 y &= -2(x^2 - 6x) - 5 \\
 y &= -2(x^2 - 6x + 9 - 9) - 5 \\
 y &= -2(x^2 - 6x + 9) + (-2)(-9) - 5 \\
 y &= -2(x-3)^2 + 13
 \end{aligned}$$

$\left(\frac{-6}{2}\right)^2 = (-3)^2 = 9$

15. If the point $(-1, 4)$ and $(2, 13)$ are on the graph of the quadratic function $f(x) = 7x^2 + bx + c$, what are the values of b and c ?

$$y = 7x^2 + bx + c$$

$$4 = 7(-1)^2 + (-1)b + c$$

$$4 = 7 - b + c$$

$$-7 \quad -7$$

$$-3 = -b + c$$

$$-6 = -2b + 2c$$

$$-15 = 2b + c$$

$$-21 = 3c$$

$$-7 = c$$

$$13 = 7(2)^2 + 2b + c$$

$$13 = 28 + 2b + c$$

$$-28 \quad -28$$

$$-15 = 2b + c$$

$$-15 = 2b + c$$

$$3 = b - c$$

$$-12 = 3b$$

$$-4 = b$$

____ / 4

$$f(x) = 7x^2 - 4x - 7$$

16. A rectangular region, placed against the wall of a house, is divided into three regions of equal area using a total of 80 m of fencing as shown. Algebraically determine the function which gives the area (A) of the entire region as a function of its width (w), and use this function to calculate the maximum possible area.

$$4x + y = 80$$

$$y = 80 - 4x$$

$$A = x(y)$$

$$A = x(80 - 4x)$$

$$A = 80x - 4x^2$$

$$A = -4x^2 + 80x$$

$$x = \frac{-b}{2a} = \frac{-80}{2(-4)} = \frac{-80}{-8} = 10$$

$$A = -4(10)^2 + 80(10)$$

$$A = -4(100) + 800$$

$$A = 400 \text{ m}^2$$

