MPM2D **UNIT 4 PROBLEM SET v2**

K/U		APP		TIPS		COMM	
	29		12		9		10

KNOWLEDGE/UNDERSTANDING

marks

[10] 1. Fill in the blanks.

a) An example of the eq'n of a parabola with a vertical compression is $y = \frac{1}{2}(x-1)^2 + 8$.

b) The optimal value of $y = -2(x+3)^2 - 5$ is: y = -3 when x = -5.

c) The y-intercept of $y = -0.5(x+1)(x-8)$ is $y = 4$.

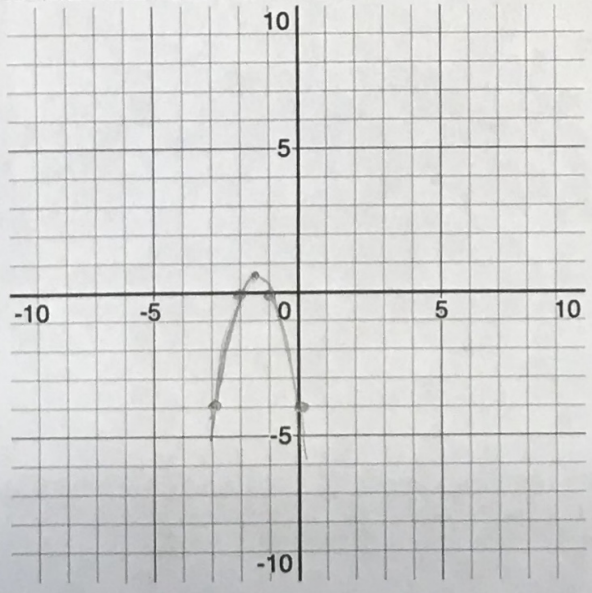
d) The equation of the axis of symmetry for $y = -3(x+9)^2 + 7$ is $x = -7$.

e) The x-intercepts of $y = 0.5(x-2)(x+10)$ are $(-2, 0)$ $(10, 0)$.

f) The vertex for $y = 0.1(x-6)^2 + 53$ is $(6, 53)$ and the direction of opening is $\uparrow$.

[10] 2.a) Complete the table, showing **all calculations** in the space below the table.

Factored Form	Vertex Form	Standard Form	dir. of open	vertex	eq'n a.o.s.	y-int	x-ints	opt. val.
$y = -2(x+1)(x+2)$	$y = -2\left(x+\frac{3}{2}\right)^2 + \frac{1}{2}$	$y = -2x^2 - 6x - 4$	$\downarrow$	$\left(-\frac{3}{2}, \frac{1}{2}\right)$	$x = -\frac{3}{2}$	$(0, -4)$	$(-2, 0)$ $(-1, 0)$	$y = \frac{1}{2}$



[5] b) Graph the parabola on graph paper, showing at least 5 key points.

[4] c) Write the transformations in words, using the proper vocabulary.

- Vertical reflection (x axis)
- Vertical stretch by a factor of 2
- Horizontal translation left by $\frac{3}{2}$ units
- Vertical translation up by $\frac{1}{2}$ unit

APPLICATION

3. Find the equation of a parabola in any form:

[4] a) having a vertical stretch by a factor of 5, horizontal translation right 3 units, vertical translation left 10 units, and the parabola opens down.

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

[4] b) zeros at $(2,0)$ and $(-3,0)$, and a y-int $(0,1.5)$. Show your calculations.

$y = a(x-2)(x+3)$

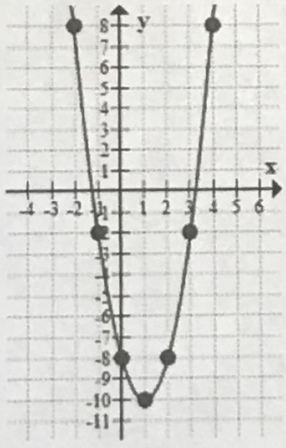
$1.5 = a[(0)-2][(0)+3]$

$\frac{1.5}{-6} = \frac{-6a}{-6}$

$-\frac{1}{4} = a$

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

[4] c) that matches the graph



$V = (1,-10)$

$y = a(x-1)^2 - 10$

$-8 = a(0-1)^2 - 10$

$-8 = 1a - 10$

$-8 + 10 = a$

$2 = a$

$y = 2(x-1)^2 - 10$

using y-int $(0,-8)$

THINKING

[9] 5. TWO TRUTHS AND A LIE. Given the equation $y = -0.5(x-6)^2 + 10$, create three statements about the parabola: two that are **true** and one that is **false** (the lie). Provide a justification with words and calculations that explains why each statement is true or false. Avoid statements that are too simple (you can see the statement is true or false without doing any work, like talking about the direction of opening, for example). You may want to organize your work in a chart:

Statement	Truth or Lie?	Justification: This statement is true/false because…
The parabola opens up.	*Lie*	*We can tell this parabola opens down because the a = – 0.5 and when "a" values are negative there is a reflection over the x-axis.*
The Vertex is (6, 10)	Truth	we can tell this is the vertex because the equation is in vertex form, (The "h" value is the same as the x value of the vertex and the "k" value is the same as the vertex's y value.
The parabola is reflected on the y axis.	Lie	Because the "a" value is negative, it shows that the parabola is reflected on the x axis.
The parabola is compressed vertically by a factor of 0.5		Because the a value is less than 1, we know it is compressed.

[10] **COMMUNICATION**

These marks will be awarded for proper presentation and mathematical form.

2a.

$y = -2x^2 - 6x - 4$

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

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

y-int

$y = -2x^2 - 6x - 4$

$y = -2(0)^2 - 6(0) - 4$

$y = -4$

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

$= \frac{6}{2(-2)}$

$= \frac{6}{-4}$

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

*see next page

$v = (-\frac{3}{2}, -16)$

$y = -2(x - \frac{3}{2})^2 - 16$

x-int

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{6 + \sqrt{-6^2 - 4(-2)(-4)}}{2(-2)}$

$x = \frac{6 + \sqrt{36 + 8(-4)}}{-4}$

$x = \frac{6 + \sqrt{4}}{-4}$

$x = \frac{6 + 2}{-4}$

$x = \frac{8}{-4}$

$x_1 = -2$

$x_2 = \frac{6 - 2}{-4}$

$x_2 = \frac{4}{-4}$

$x_2 = -1$

Over

$y = -2x^2 - 6x - 4$

$= -2\left(\frac{-3}{2}\right)^2 - 6\left(\frac{-3}{2}\right) - 4$

$= -2\left(\frac{9}{4}\right) + \left(\frac{18}{2}\right) - \frac{8}{2}$

$= -\frac{18}{4} + \frac{36}{4} - \frac{16}{4}$

$= \frac{2}{4}$

$= \frac{1}{2}$

$y = -0.5(x+1)(x-8)$
$= -0.5(0+1)(0-8)$
$= -0.5(-8)$
$= 4$