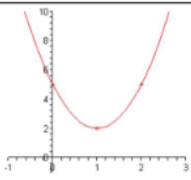


MPM2D – Unit 4 Test Review – Quadratics in Standard Form

Part A: Identifying Quadratic Relations

1. For each of the relationships described below by either a table of values, graph, or equation, indicate whether the relationship is linear or quadratic and give a reason for your answer.

Relationship	Linear or Quadratic	Reasoning										
<table border="1"> <thead> <tr> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4</td> </tr> <tr> <td>2</td> <td>7</td> </tr> <tr> <td>3</td> <td>12</td> </tr> <tr> <td>4</td> <td>19</td> </tr> </tbody> </table>	X	Y	1	4	2	7	3	12	4	19	quadratic	2nd diff Same
X	Y											
1	4											
2	7											
3	12											
4	19											
$y = 2x^2 + 3x + 2$ $y = -2x^2 + 5$	quadratic	x^2 is the largest exponent										
	quadratic	parabola shape										
$y = -4x + 3$	linear	- $y = mx + b$ - 1 is largest exponent										
<table border="1"> <thead> <tr> <th>X</th> <th>Y</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>9</td> </tr> <tr> <td>2</td> <td>16</td> </tr> <tr> <td>3</td> <td>23</td> </tr> </tbody> </table>	X	Y	1	9	2	16	3	23	linear	1st diff same		
X	Y											
1	9											
2	16											
3	23											

Part B: Information from Standard Form

2. Fill in the chart below to show your understanding of quadratics in standard form.

Equation	Direction of Opening	Axis of Symmetry	Vertex	y-intercept	Number of Zeros
$y = x^2 - 2x - 3$	up	$x = \frac{-b}{2a} = 1$	(1, -4)	-3 (0, -3)	$b^2 - 4ac$ 2
$y = -2x^2 + 12x - 18$	down	$x = \frac{-b}{2a} = 3$	(3, 0)	-18 (0, -18)	1
$y = x^2 - 4x + 7$	up	$x = \frac{-b}{2a} = 2$	(2, 3)	+7 (0, 7)	0

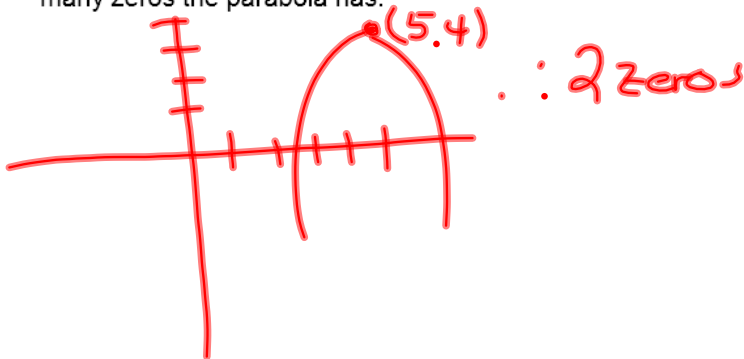
3. Solve the quadratic relationship, $y = x^2 - 2x - 3$, by finding the x-intercepts or zeros.

$$\begin{aligned}
 a &= 1 \\
 b &= -2 \\
 c &= -3
 \end{aligned}
 \quad
 x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{2 \pm \sqrt{16}}{2}$$

$$\begin{aligned}
 &\rightarrow \frac{2+4}{2} = 3 \\
 &\rightarrow \frac{2-4}{2} = -1
 \end{aligned}$$

4. You are told that a parabola opens down and has a vertex of (5,4). Explain how you know how many zeros the parabola has.



Part C: Graphing Quadratics in Standard Form

5. For the quadratic relationship, $y = x^2 - 6x + 9$, graph the parabola on the grid below as accurately as possible. **SHOW ALL YOUR WORK TO OBTAIN FULL MARKS.**

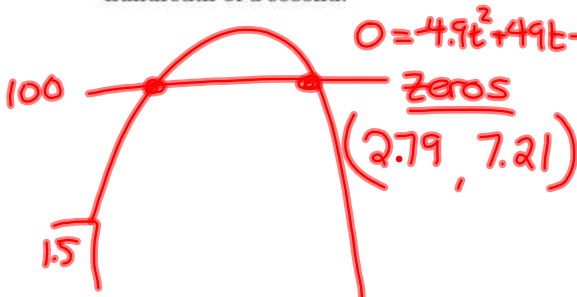
Part D: Problem Solving with Quadratics in Standard Form

Example 2: A company models its annual profits using the function $P(x) = x^2 + 20x - 300$, where P represents profits and x gives the number of units sold. One year, their profits were \$167,700. How many units of their product did they sell?

2. A firework is launched upward at an initial velocity of 49 m/s, from a height of 1.5 m above the ground. The height of the firework, in metres, after t seconds, is modelled by the equation

$100 h = -4.9t^2 + 49t + 1.5$

- a) What is the maximum height of the firework above the ground? **(5, 124)**
 b) Over what time interval is the height of the firework greater than 100 m above the ground? Round to the nearest hundredth of a second.



The path of a basketball after it is thrown from a height of 1.5 m above the ground is given by the equation $h = -0.25d^2 + 2d + 1.5$, where h is the height, in metres, and d is the horizontal distance, in metres.

- a) How far has the ball travelled horizontally, to the nearest tenth of a metre, when it lands on the ground?
 b) Find the horizontal distance when the basketball is at a height of 4.5 m above the ground.

