

12 - Worksheet

Part 1: Math 20-2 Worksheet

Q1: Given the equation $f(x) = x^2 + 2x - 3$,

- a. Use factoring to determine the zeroes.

$$0 = x^2 + 2x - 3$$

$$\begin{array}{l} -1 \quad +3 \\ \square + \square = 2 \\ \square \times \square = -3 \end{array} \quad 1, 3$$

$$0 = (x - 1)(x + 3)$$

$$\begin{array}{l} \swarrow \\ x - 1 = 0 \\ +1 \quad +1 \\ \boxed{x = 1} \end{array} \quad \begin{array}{l} \searrow \\ x + 3 = 0 \\ -3 \quad -3 \\ \boxed{x = -3} \end{array}$$

- b. Use the zeroes to determine the axis of symmetry.

$$\frac{(1) + (-3)}{2} = -1 \quad \boxed{x = -1}$$

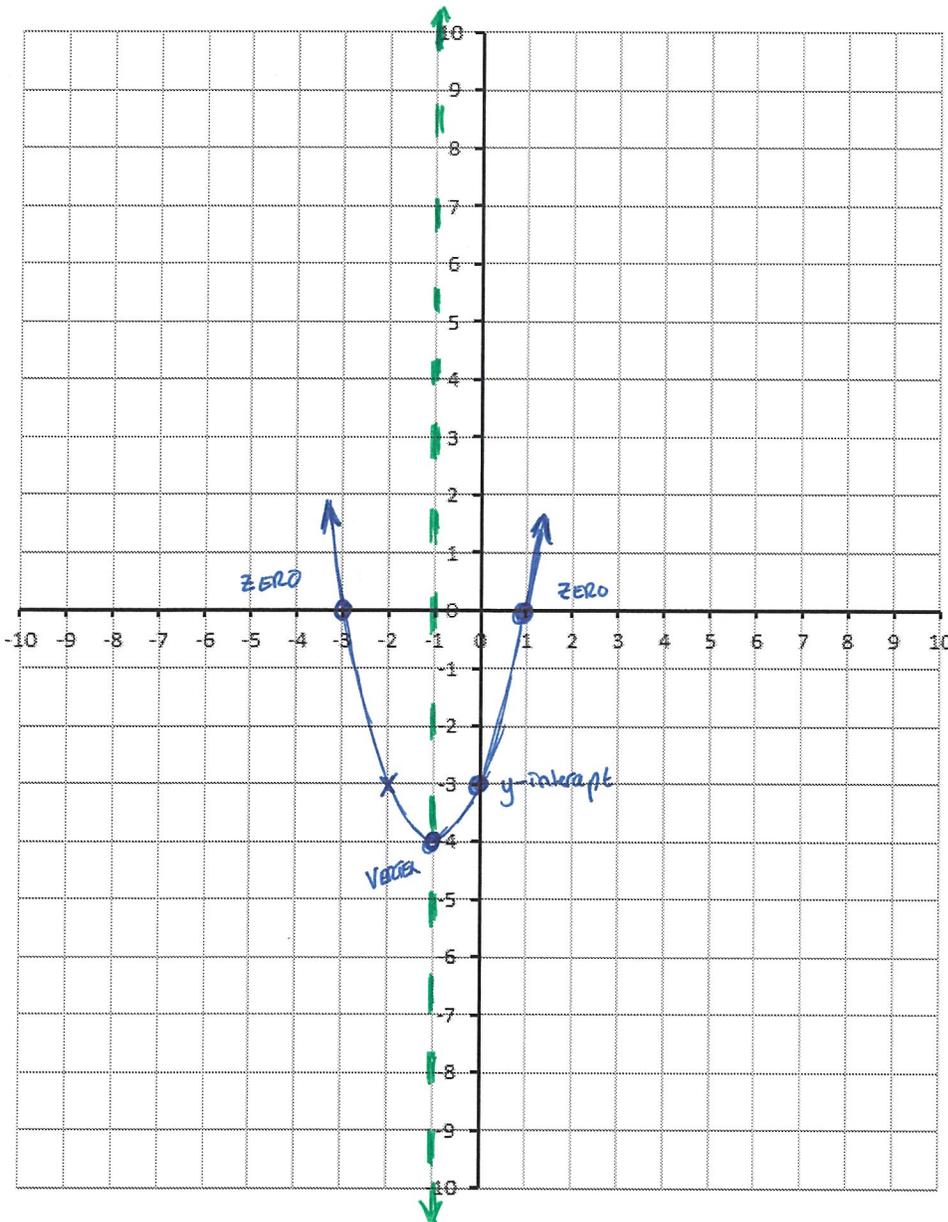
- c. Use the method of your choice to determine the coordinates of the vertex.

- Option #1: Use your T.I. Calculator
- Option #2: Use the x-coordinate (from the axis of symmetry) to find y.

$$\begin{aligned} f(x) &= x^2 + 2x - 3 \\ f(-1) &= (-1)^2 + 2(-1) - 3 \\ &= 1 - 2 - 3 \\ &= -4 \end{aligned}$$

$$\boxed{\text{Vertex at } (-1, -4)}$$

- d. Sketch a graph of the function, with clearly labelled (i) vertex, (ii) zeroes, (iii) axis of symmetry, and (d) y-intercept value.



- e. State the Domain and Range for the function.

$$\text{Domain: } \{x \mid -\infty < x < \infty, x \in \mathbb{R}\} \text{ or } \{x \in \mathbb{R}\} \text{ or } (-\infty, \infty)$$

$$\text{Range: } \{y \mid -4 \leq y < \infty, y \in \mathbb{R}\} \text{ or } \{y \mid y \geq -4, y \in \mathbb{R}\} \text{ or } [-4, \infty)$$

Q2: Given the equation $f(x) = 4x^2 - 1$,

- a. Use factoring to determine the zeroes.

$$0 = 4x^2 + 0x - 1$$

$$0 = (2x+1)(2x-1)$$

$$2x+1=0$$

$$\begin{array}{cc} -1 & -1 \end{array}$$

$$2x = -1$$

$$\div 2 \quad \div 2$$

$$\boxed{x = -\frac{1}{2}}$$

$$2x-1=0$$

$$\begin{array}{cc} +1 & +1 \end{array}$$

$$2x = 1$$

$$\div 2 \quad \div 2$$

$$\boxed{x = \frac{1}{2}}$$

- b. Use the zeroes to determine the axis of symmetry.

$$\frac{\left(-\frac{1}{2}\right) + \left(\frac{1}{2}\right)}{2} = 0$$

$$\boxed{x = 0}$$

- c. Use the method of your choice to determine the coordinates of the vertex.

- i. Option #1: Use your T.I. Calculator
- ii. Option #2: Use the x-coordinate (from the axis of symmetry) to find y.

$$f(x) = 4(x)^2 - 1$$

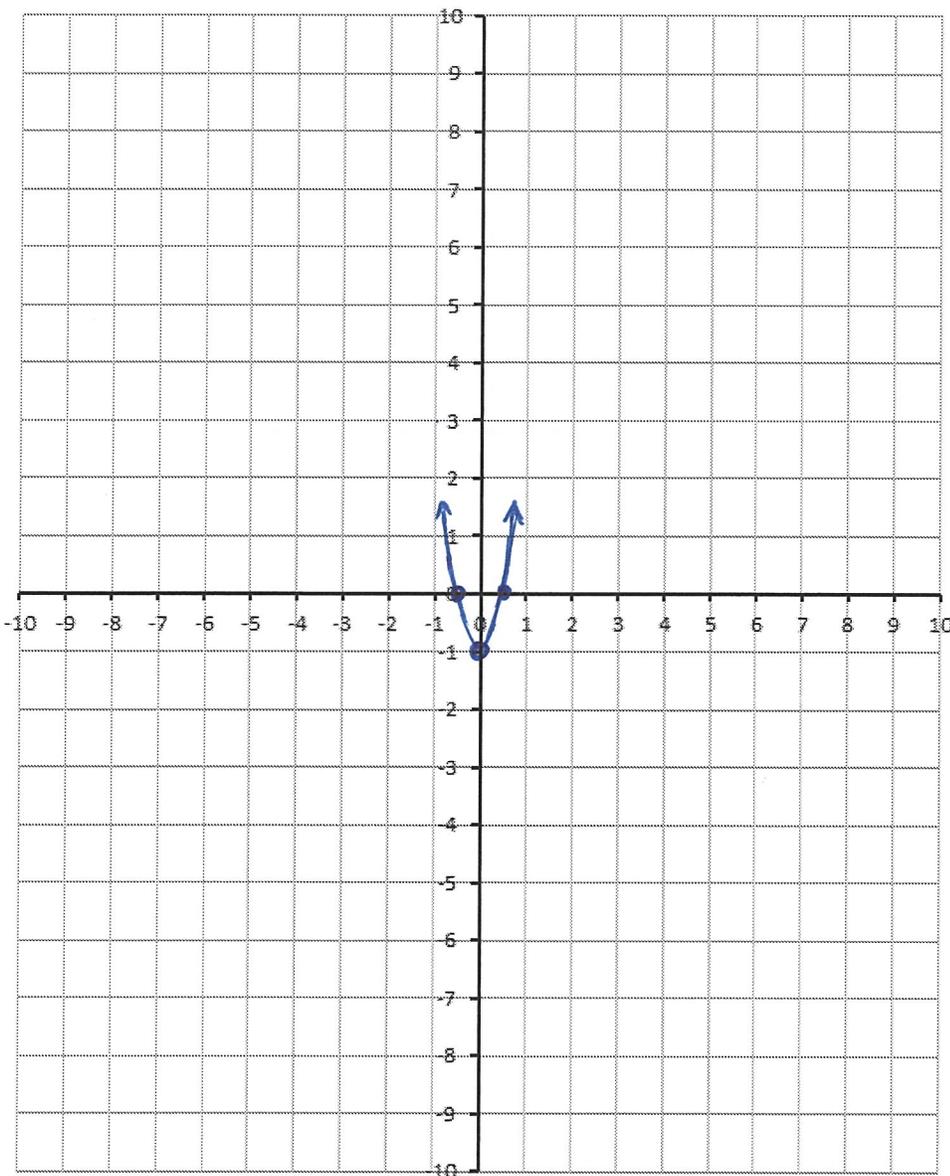
$$f(0) = 4(0)^2 - 1$$

$$= 0 - 1$$

$$= -1$$

$$\boxed{\text{Vertex at } (0, -1)}$$

- d. Sketch a graph of the function, with clearly labelled (i) vertex, (ii) zeroes, (iii) axis of symmetry, and (d) y-intercept value.



- e. State the Domain and Range for the function.

$$\text{Domain: } \{x \mid -\infty < x < \infty, x \in \mathbb{R}\} \text{ or } \{x \in \mathbb{R}\} \text{ or } (-\infty, \infty)$$

$$\text{Range: } \{y \mid -1 \leq y < \infty, y \in \mathbb{R}\} \text{ or } \{y \mid y \geq -1, y \in \mathbb{R}\} \text{ or } [-1, \infty)$$

Q3: Given the equation $f(x) = -x^2 - 6x - 8$,

- a. Use factoring to determine the Zeroes.

$$\begin{aligned}
 0 &= -x^2 - 6x - 8 \\
 0 &= -1(x^2 + 6x + 8) && \begin{array}{l} +2 \quad +4 \\ \square + \square = 6 \\ \square \times \square = 8 \end{array} \\
 \div (-1) \quad \div (-1) & \\
 0 &= x^2 + 6x + 8 \\
 0 &= (x+2)(x+4) \\
 \begin{array}{l} \swarrow \\ x+2=0 \\ -2 \quad -2 \\ \hline x=-2 \end{array} & \quad \begin{array}{l} \searrow \\ x+4=0 \\ -4 \quad -4 \\ \hline x=-4 \end{array}
 \end{aligned}$$

- b. Use the zeroes to determine the axis of symmetry.

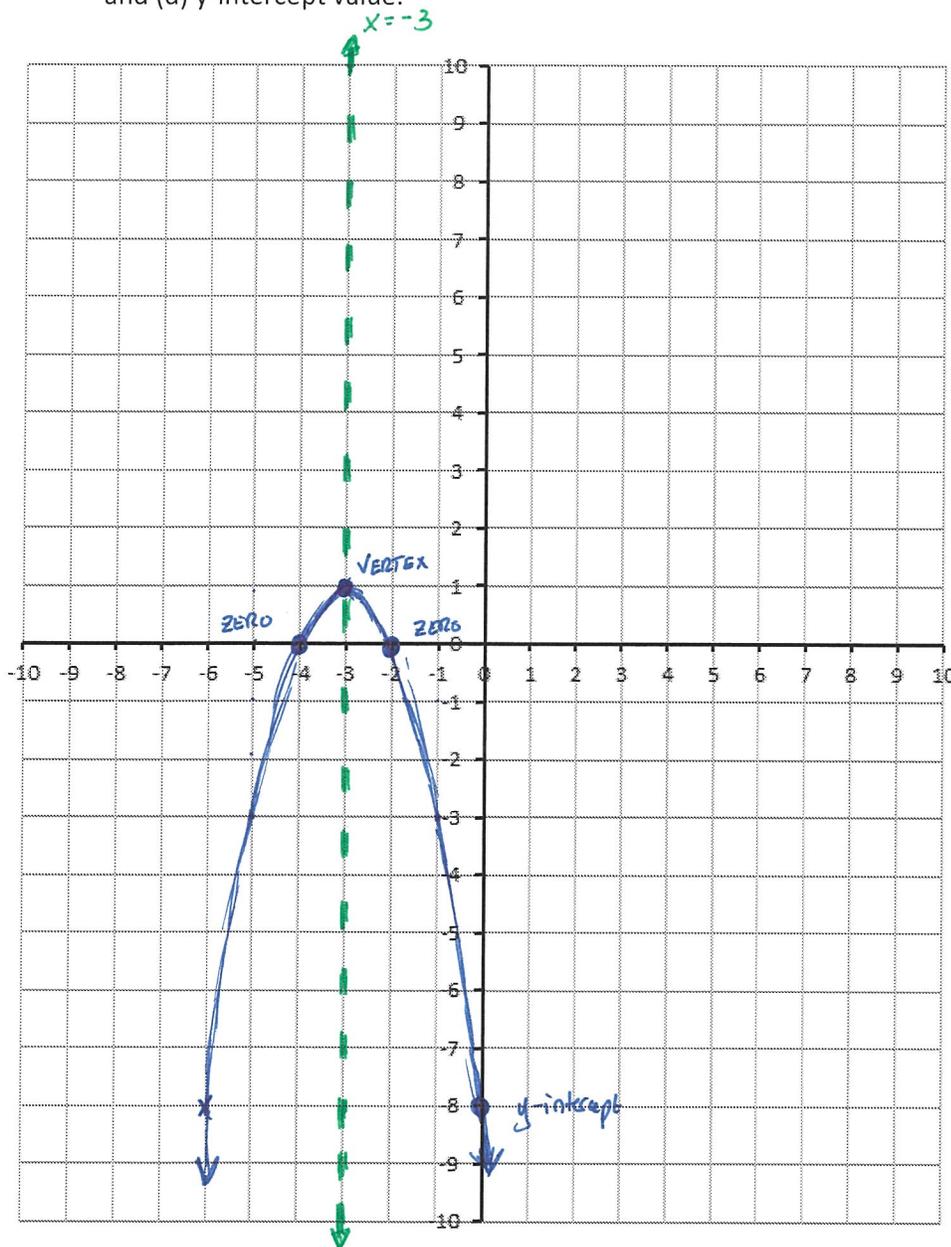
$$\frac{(-2) + (-4)}{2} = -3 \quad \boxed{x = -3}$$

- c. Use the method of your choice to determine the coordinates of the vertex.

- i. Option #1: Use your T.I. Calculator
- ii. Option #2: Use the x-coordinate (from the axis of symmetry) to find y.

$$\begin{aligned}
 f(x) &= -x^2 - 6x - 8 \\
 f(-3) &= -(-3)^2 - 6(-3) - 8 \\
 f(-3) &= -9 + 18 - 8 \\
 f(-3) &= 1 \\
 \text{Vertex at } &(-3, 1)
 \end{aligned}$$

- d. Sketch a graph of the function, with clearly labelled (i) vertex, (ii) zeroes, (iii) axis of symmetry, and (d) y-intercept value.



- e. State the Domain and Range for the function.

$$\text{Domain: } \{x \mid -\infty < x < \infty, x \in \mathbb{R}\} \text{ or } \{x \in \mathbb{R}\} \text{ or } (-\infty, \infty)$$

$$\text{Range: } \{y \mid -\infty < y \leq 1, y \in \mathbb{R}\} \text{ or } \{y \mid y \leq 1, y \in \mathbb{R}\} \text{ or } (-\infty, 1]$$

Q4: Given the equation $f(x) = 2x^2 + 4x - 6$,

a. Use factoring to determine the zeroes.

$$\begin{aligned}
 0 &= 2x^2 + 4x - 6 \\
 0 &= 2(x^2 + 2x - 3) \\
 \div 2 \quad \div 2 & & -1 \quad +3 \\
 0 &= x^2 + 2x - 3 & \square + \square = 2 \\
 0 &= (x-1)(x+3) & \square \times \square = -3 \\
 \swarrow & & \searrow \\
 x-1 &= 0 & x+3 &= 0 \\
 +1 \quad +1 & & -3 \quad -3 & \\
 \boxed{x=1} & & \boxed{x=-3} &
 \end{aligned}$$

b. Use the zeroes to determine the axis of symmetry.

$$\frac{(1) + (-3)}{2} = -1 \quad \boxed{x=-1}$$

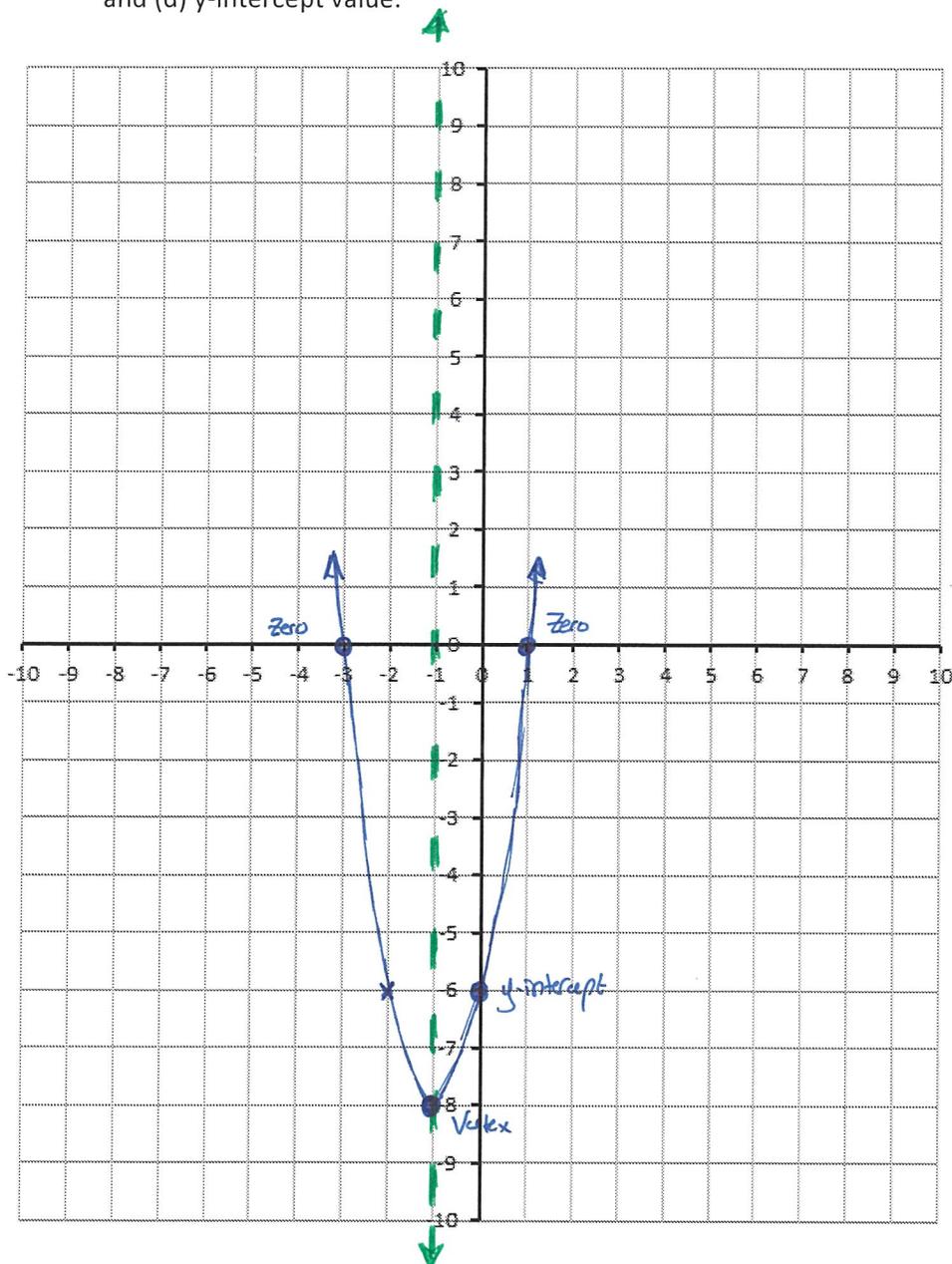
c. Use the method of your choice to determine the coordinates of the vertex.

- i. Option #1: Use your T.I. Calculator
- ii. Option #2: Use the x-coordinate (from the axis of symmetry) to find y.

$$\begin{aligned}
 f(x) &= 2x^2 + 4x - 6 \\
 f(-1) &= 2(-1)^2 + 4(-1) - 6 \\
 &= 2(1) + 4(-1) - 6 \\
 &= 2 - 4 - 6 \\
 &= -8
 \end{aligned}$$

Vertex at $(-1, -8)$

- d. Sketch a graph of the function, with clearly labelled (i) vertex, (ii) zeroes, (iii) axis of symmetry, and (d) y-intercept value.



- e. State the Domain and Range for the function.