

# Quiz 8

22 October 2009

*Show all work to support your solutions. Be sure to check your solutions.*

Consider the following function.

$$f(x) := -x^2 + 3x + 10$$

1. (2 Points) Determine  $\text{dom}(f)$  and  $\text{ran}(f)$ .

$$a = -1, \quad b = 3, \quad c = 10$$

Axis of Symmetry:

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

y-Coordinate of the Vertex:

$$f\left(\frac{3}{2}\right) = -\left(\frac{3}{2}\right)^2 + 3\left(\frac{3}{2}\right) + 10 = \frac{-9}{4} + \frac{9}{2} + 10 = \frac{49}{4}$$

Therefore, as  $a < 0$ ,

$$\begin{aligned} \text{dom}(f) &= \mathbb{R}, \\ \text{ran}(f) &= \left(-\infty, \frac{49}{4}\right]. \end{aligned}$$

2. (2 Points) Determine the extrema of  $f$ .

As  $a < 0$ ,

$$\begin{aligned} \text{min:} & \quad \emptyset, \\ \text{max:} & \quad \left(\frac{3}{2}, \frac{49}{4}\right). \end{aligned}$$

3. (2 Points) Determine the intervals of increase and decrease for  $f$ .

As  $a < 0$ ,

$$\text{inc: } \left(-\infty, \frac{3}{2}\right),$$

$$\text{dec: } \left(\frac{3}{2}, \infty\right).$$

4. (2 Points) Determine the zeroes of  $f$ .

Discriminant:

$$D = (3)^2 - 4(-1)(10) = 9 + 40 = 49.$$

As  $D > 0$ ,

$$x = \frac{3}{2} \pm \frac{1}{2(-1)}\sqrt{49} = \frac{3}{2} \mp \frac{7}{2} = \frac{-4}{2}, \frac{10}{2} = -2, 5.$$

$$\text{zeroes: } (-2, 0), (5, 0)$$

5. (2 Points) Sketch a graph of  $f$  on the axes provided, labeling all important features.

