Quadratics 4.1 Name Per:

(Section 4.1- No Calculators)

1. Consider $f(x) = -2x^2 + 12x - 7$

   (a) Complete the square to get f in $f(x) = a(x-h)^2 + k$ form

   $$\begin{aligned} f(x) &= -2x^2 + 12x - 7 \\ &= -2(x^2 - 6x + \_\_) - 7 \\ &= -2(x^2 - 6x + 9) - 7 + 2(9) \\ &= -2(x-3)^2 + 11 \end{aligned}$$

   (b) Where is the vertex? (3,11)

   (c) What is the equation of the axis of symmetry? x=3

   (d) Where are the zeros (roots) of f?

   $$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-12 \pm \sqrt{12^2 - 4(-2)(-7)}}{2(-2)} \\ &= \frac{-12 \pm \sqrt{144 - 56}}{-4} \\ &= 3 \pm \frac{\sqrt{22}}{2} \end{aligned}$$

   (e) Where is the y-intercept?
   $f(0) = -7$, so $(0, -7)$

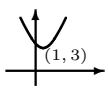
2. Consider $f(x) = 2x^2 - 4x + 5$

   (a) Use the "'Option 2" or formula method to find the coordinates of the vertex

   $$\frac{-b}{2a} = \frac{-(-4)}{2(2)} = 1$$
   $$f(1) = 2(1^2) - 4(1) + 5 = 3$$

   So the vertex is $(1, 3)$

   (b) Sketch a graph of this function.

   axis of symetry $x = 1$,
   other points: $(0, 5)$, $(2, 5)$

1. Consider $f(x) = 3x^2 - 12x + 11$

   (a) Complete the square to get f in $f(x) = a(x-h)^2 + k$ form

   $$\begin{aligned} f(x) &= 3x^2 - 12x + 11 \\ &= 3(x^2 - 4x + \_\_) + 11 \\ &= 3(x^2 - 4x + 4) + 11 - 3(4) \\ &= 3(x-2)^2 - 1 \end{aligned}$$

   (b) Where is the vertex?
   $(2, -1)$

   (c) What is the equation of the axis of symmetry?
   $x = 2$

   (d) Where are the zeros (roots) of f?

   $$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-(-12) \pm \sqrt{(-12)^2 - 4(3)(11)}}{2(3)} \\ &= \frac{12 \pm \sqrt{144 - 132}}{6} \\ &= 2 \pm \frac{\sqrt{3}}{3} \end{aligned}$$

   (e) Where is the y-intercept?
   $f(0) = 11$ so $(0, 11)$

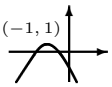
2. Consider $f(x) = -3x^2 - 6x - 2$

   (a) Use the "'Option 2" or formula method to find the coordinates of the vertex

   $$\frac{-b}{2a} = \frac{-(-6)}{2(-3)} = -1$$
   $$f(-1) = -3((-1)^2) - 6(-1) - 2 = 1$$

   So the vertex is $(-1, 1)$

   (b) Sketch a graph of this function.

   axis of symmetry: $x = -1$,
   other points:$(0, -2)$, $(-2, -2)$

3. (a) $b^2 - 4ac < 0$:
   Never Crosses the x-axis
   (b) $b^2 - 4ac = 0$:
   Crosses x-axis once
   (c) $b^2 - 4ac > 0$:
   Crosses x-axis twice

2. $f(x) = 5x^2 - 20x + 21$
   (a) Complete the square to get f in $a(x-h)^2 + k$ form

   (b) Coords of the vertex (h, k):

Now try this:

1. $f(x) = 3x^2 + 24x + 13$
   (a) Complete the square to get f in $a(x-h)^2 + k$ form

   (c) Axis of symmetry $(x = h)$:

   (b) Coords of the vertex (h, k):

   (d) Confirm using "Method 2" $\dfrac{-b}{2a}$:

   (c) Axis of symmetry $(x = h)$:

   (d) Confirm using "Method 2" $\dfrac{-b}{2a}$:

Answers:1a $3(x+4)^2 - 35$, 1b.$(-4, -35)$,
1c. $x = -4$, 1d. $\dfrac{-24}{2(3)} = -4$ and $f(-4) = -35$
2a $5(x-2)^2 + 1$, 2b.$(2, 1)$,
2c. $x = 2$, 2d. $\dfrac{-(-20)}{2(5)} = 2$ and $f(2) = 1$