9.11

1) $y = x^2 - 2x - 8$
$y - inter: (0, -8)$
$x - inter: 0 = x^2 - 2x - 8$
$\qquad 0 = (x - 4)(x + 2)$
$\qquad x - 4 = 0 \quad x + 2 = 0$
$\qquad \underline{+4 \quad +4 \quad -2 \quad -2}$
$\qquad x = 4 \qquad x = -2$
$\qquad (4, 0), \ (-2, 0)$
$vertex: x = \frac{2}{2(1)} = \frac{2}{2} = 1$
$\qquad y = (1)^2 - 2(1) - 8$
$\qquad y = 1 - 2 - 8$
$\qquad y = -9$
$\qquad (1, -9)$

$(-2, 0) \qquad (4, 0)$

$(0, -8)$

$(1, -9)$
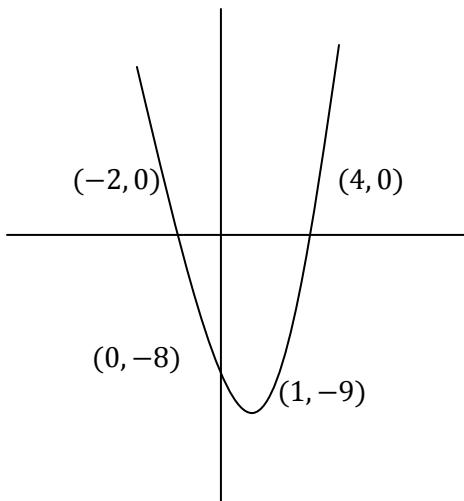
3) $y = 2x^2 - 12x + 10$
$y - inter: (0, 10)$
$x - inter: 0 = 2x^2 - 12x + 10$
$\qquad 0 = 2(x^2 - 6x + 5)$
$\qquad 0 = 2(x - 5)(x - 1)$
$\qquad x - 5 = 0 \quad x - 1 = 0$
$\qquad \underline{+5 \quad +5 \quad +1 \quad +1}$
$\qquad x = 5 \qquad x = 1$
$\qquad (5, 0) \ (1, 0)$
$vertex: x = \frac{12}{2(2)} = \frac{12}{4} = 3$
$\qquad y = 2(3)^2 - 12(3) + 10$
$\qquad y = 2(9) - 36 + 10$
$\qquad y = 18 - 36 + 10$
$\qquad y = -8$
$\qquad (3, -8)$

$(0, 10)$

$(1, 0) \ (3, 0)$

$(3, -8)$
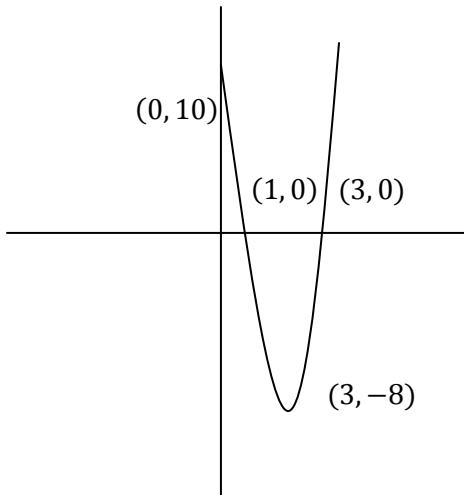
5) $y = -2x^2 + 12x - 18$
$y - inter: (0, 10)$
$x - inter: 0 = -2x^2 + 12x - 18$
$\qquad 0 = -2(x^2 - 6x + 9)$
$\qquad 0 = -2(x - 3)^2$
$\qquad x - 3 = 0$
$\qquad \underline{+3 \quad +3}$
$\qquad x = 3$
$\qquad (3, 0)$
$vertex: x = \frac{-12}{2(-2)} = \frac{-12}{-4} = 3$

$(3, 0)$

$(0, -18)$
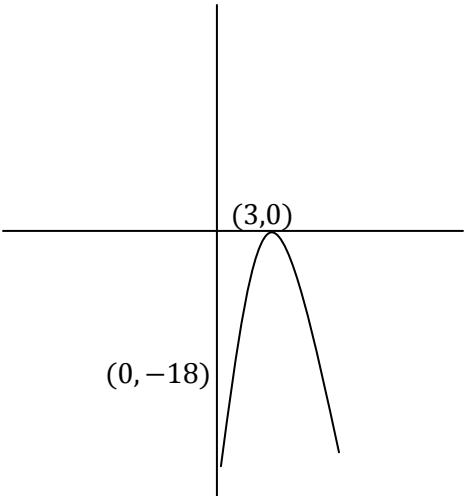
$$y = -2(3)^2 + 12(3) - 18$$
$$y = -2(9) + 36 - 18$$
$$y = -18 + 36 - 18$$
$$y = 0$$
$$(3, 0)$$

7) $y = -3x^2 + 24x - 45$
   $y - inter: (0, -45)$
   $x - inter: 0 = -3x^2 + 24x - 45$
   $\qquad\qquad 0 = -3(x^2 - 8x + 15)$
   $\qquad\qquad 0 = -3(x - 5)(x - 3)$
   $\qquad x - 5 = 0 \quad x - 3 = 0$
   $\qquad \underline{+5 \quad +5 \quad +3 \quad +3}$
   $\qquad\quad x = 5 \qquad x = 3$
   $\qquad (5, 0) \ (3, 0)$
   $vertex: x = \frac{-24}{2(-3)} = \frac{-24}{-6} = 4$
   $\qquad y = -3(4)^2 + 24(4) - 45$
   $\qquad y = -3(16) + 96 - 45$
 $\qquad y = -48 + 96 - 45$
   $\qquad y = 3$
   $\qquad (4, 3)$

(4,3)
(5,0)
(3,0)
(−45,0)
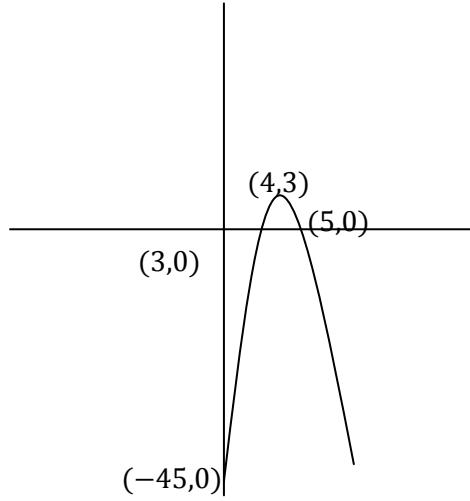
9) $y = -x^2 + 4x + 5$
   $y - inter: (0, 9)$
   $x - inter: 0 = -x^2 + 4x + 5$
   $\qquad\qquad 0 = -1(x^2 - 4x - 5)$
   $\qquad\qquad 0 = -1(x - 5)(x + 1)$
   $\qquad x - 5 = 0 \quad x + 1 = 0$
   $\qquad \underline{+5 \quad +5 \quad -1 \quad -1}$
   $\qquad\quad x = 5 \qquad x = -1$
   $\qquad (5, 0) \qquad (-1, 0)$
   $vertex: x = \frac{-4}{2(-1)} = \frac{-4}{-2} = 2$
   $\qquad y = -(2)^2 + 4(2) + 5$
   $\qquad y = -4 + 8 + 5$
   $\qquad y = 9$
   $\qquad (2, 9)$

(2, 9)
(0,5)
(−1,0)
(5,0)
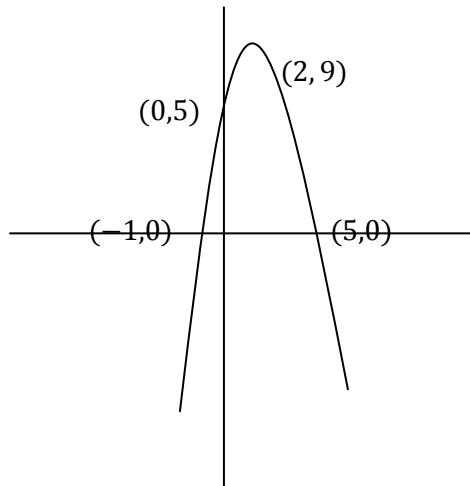
11) $y = -x^2 + 6x - 5$
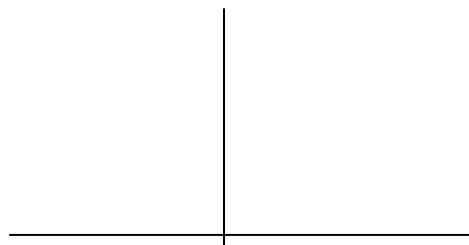
$y - inter: (0, -5)$
$x - inter: 0 = -x^2 + 6x - 5$
$ 0 = -1(x^2 - 6x + 5)$
$ 0 = -1(x - 1)(x - 5)$
$ x - 1 = 0 \quad x - 5 = 0$
$ \underline{+1 \quad +1 \quad\ + 5 \quad +5}$
$ \quad x = 1 \qquad x = 5$
$ \quad (1, 0) \qquad (5, 0)$
$vertex: x = \dfrac{-6}{2(-1)} = \dfrac{-6}{-2} = 3$
$ y = -(3)^2 + 6(3) - 5$
$ y = -9 + 18 - 5$
$ y = 4$
$ (3, 4)$

(3,4)
(1,0) (5,0)
(0,−5)
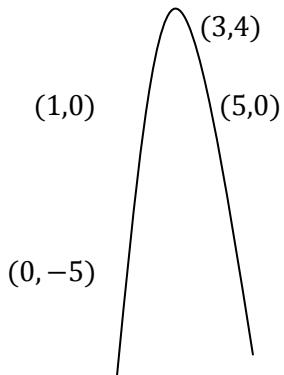
13) $y = -2x^2 + 16x - 24$
$\quad y - inter: (0, -24)$
$\quad x - inter: 0 = -2x^2 + 16x - 24$
$ 0 = -2(x^2 - 8x + 12)$
$ 0 = -2(x - 2)(x - 6)$
$ x - 2 = 0 \quad x - 6 = 0$
$ \underline{+2 \quad +2 \quad\ + 6 \quad +6}$
$ \quad x = 2 \qquad x = 6$
$ \quad (2, 0) \qquad (6, 0)$
$\quad vertex: x = \dfrac{-16}{2(-2)} = \dfrac{-16}{-4} = 4$
$ y = -2(4)^2 + 16(4) - 24$
$ y = -2(16) + 64 - 24$
$ y = -32 + 64 - 24$
$ y = 8$
$ (4, 8)$

(4,8)
(2,0) (6,0)
(0,−24)
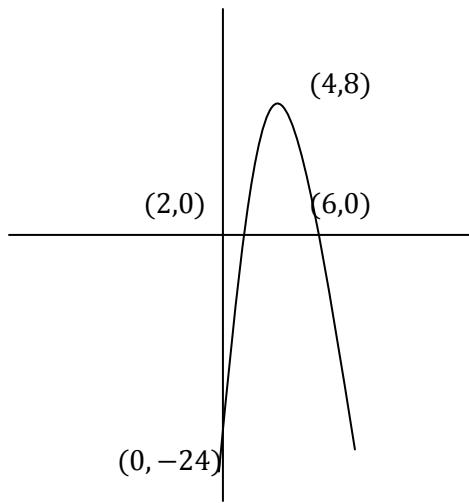
15) $y = 3x^2 + 12x + 9$
$\quad y - inter: (0, 9)$
$\quad x - inter: 0 = 3x^2 + 12x + 9$
$ 0 = 3(x^2 + 4x + 3)$
$ 0 = 3(x + 1)(x + 3)$
$ x + 1 = 0 \quad x + 3 = 0$
$ \underline{-1 \quad -1 \quad\ - 3 \quad -3}$
$ \quad x = -1 \qquad x = -3$
$ \quad (-1, 0) \qquad (-3, 0)$
$\quad vertex: x = \dfrac{-12}{2(3)} = \dfrac{-12}{6} = -2$
$ y = 3(-2)^2 + 12(-2) + 9$

(0,9)
(−3,0) (−1,0)
(−2,−3)
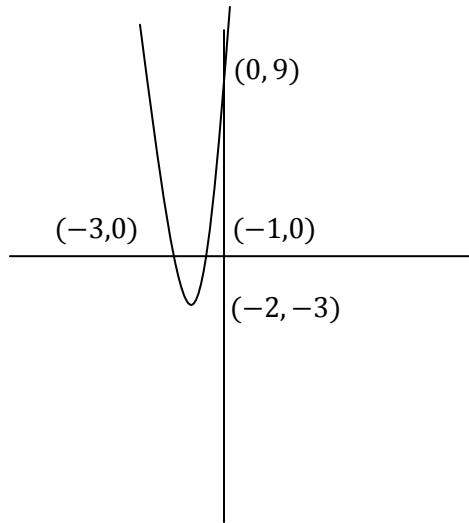
$$y = 3(4) - 24 + 9$$
$$y = 12 - 24 + 9$$
$$y = -3$$
$$(-2, -3)$$

17) $y = 5x^2 - 40x + 75$

    $y - inter: (0, 75)$

    $x - inter: 0 = 5x^2 - 40x + 75$

             $0 = 5(x^2 - 8x + 15$

             $0 = 5(x - 3)(x - 5)$

        $x - 3 = 0 \quad x - 5 = 0$

        $\underline{+3 \quad +3 \quad +5 \quad +5}$

          $x = 3 \qquad x = 5$

    $vertex: \frac{40}{2(5)} = \frac{40}{10} = 4$

        $y = 5(4)^2 - 40(4) + 75$

        $y = 5(16) - 160 + 75$

        $y = 80 - 160 + 75$

        $y = -5$

        $(4, -5)$

(0,75)   (0,3)   (0,5)   (4, -5)
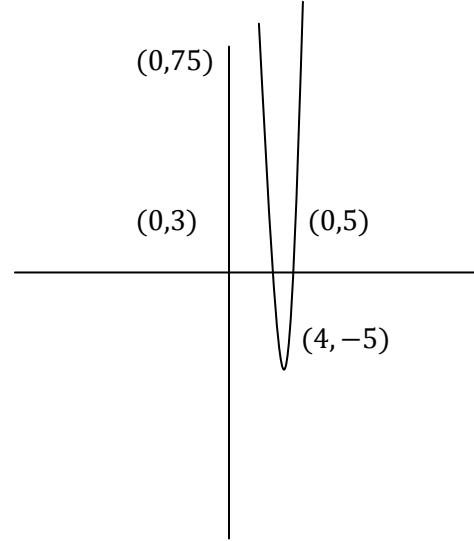
19) $y = -5x^2 - 60x - 175$

    $y - inter: (0, -175)$

    $x - inter: 0 = -5x^2 - 60x - 175$

             $0 = -5(x^2 + 12x + 35)$

             $0 = -5(x + 5)(x + 7)$

        $x + 5 = 0 \quad x + 7 = 0$

        $\underline{-5 \quad -5 \quad -7 \quad -7}$

          $x = -5 \qquad x = -7$

          $(-5, 0) \qquad (-7, 0)$

    $vertex: x = \frac{60}{2(-5)} = \frac{60}{-10} = -6$

        $y = -5(-6)^2 - 60(-6) - 175$

        $y = -5(36) + 360 - 175$

        $y = -180 + 360 - 175$

        $y = 5$

        $(-6, 5)$

(−6,5)   (−7,0)   (−5,0)   (0, −175)