Graph each function. *State and label* the axis of symmetry, the coordinates of the vertex, and 2 other points. Show all work in a neat, organized manner. You must have at least 5 points, including the vertex.

1.　$y = 2x^2 + 4x - 2$

- opens up ∪
- aos:　$x = \dfrac{-b}{2a} = \dfrac{-4}{2(2)} = \dfrac{-4}{4} = -1$

  $\boxed{x = -1}$

- vertex: $(x, y) \rightarrow (-1, -4)$

  $y = 2(-1)^2 + 4(-1) - 2$
  $= 2 - 4 - 2 = -2 - 2 = -4$

- points:

x	y
0	-2
1	4

  $x = 0$
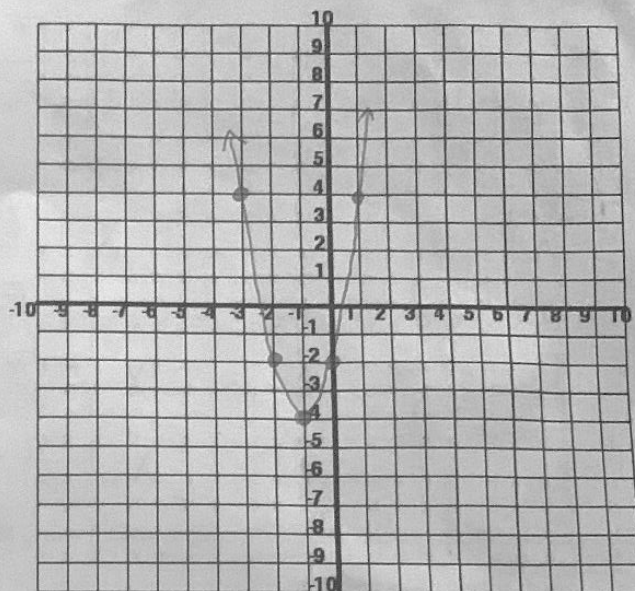 $y = 2(0)^2 + 4(0) - 2$
  $y = 0 + 0 - 2 = -2$

  $x = 1$
  $y = 2(1)^2 + 4(1) - 2$
  $y = 2 + 4 - 2 = 6 - 2 = 4$

2.　$y = -2x^2 + 12x - 19$

- opens down ∩
- aos:　$x = \dfrac{-b}{2a} = \dfrac{-12}{2(-2)} = \dfrac{-12}{-4} = 3$

  $x = 3$

- vertex: $(x, y) \rightarrow (3, -1)$

  $y = -2(3)^2 + 12(3) - 19$
  $= -2(9) + 36 - 19 = -18 + 36 - 19$
  $= 18 - 19 = -1$

- points:

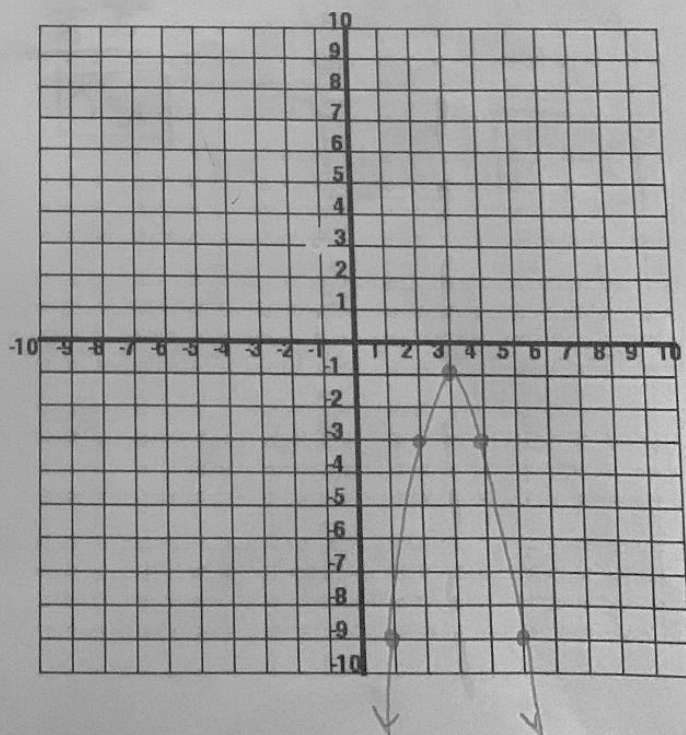 | x | y |
  |---|---|
  | 1 | -9 |
  | 2 | -3 |

  $x = 1$
  $y = -2(1)^2 + 12(1) - 19$
  $y = -2 + 12 - 19 = 10 - 19 = -9$

  $x = 2$
  $y = -2(2)^2 + 12(2) - 19$
  $= -2(4) + 24 - 19 = -8 + 24 - 19 = 16 - 19 = -3$

Solve each quadratic equation by taking square roots. Show all work. Make sure your answer is completely simplified. Circle your final answer(s).

3.) $6x^2 + 9 = 33$

$$\frac{-9 \quad -9}{6x^2 = 24}$$
$$\frac{6x^2}{6} = \frac{24}{6}$$
$$\sqrt{x^2} = \sqrt{4}$$
$$x = \pm\sqrt{4}$$
$$\boxed{x = \pm 2}$$

4.) $36x^2 - 7 = 93$

$$\frac{+7 \quad +7}{36x^2 = 100}$$
$$\frac{36x^2}{36} = \frac{100}{36}$$
$$\sqrt{x^2} = \sqrt{\frac{100}{36}}$$
$$x = \pm\sqrt{\frac{100}{36}}$$
$$x = \pm\frac{\sqrt{100}}{\sqrt{36}}$$
$$x = \pm\frac{10}{6} \rightarrow \boxed{x = \pm\frac{5}{3}}$$

5.) $5x^2 + 3 = 43$

$$\frac{-3 \quad -3}{5x^2 = 40}$$
$$\frac{5x^2}{5} = \frac{40}{5}$$
$$\sqrt{x^2} = \sqrt{8}$$
$$x = \pm\sqrt{8}$$
$$x = \pm\sqrt{4 \cdot 2}$$
$$\boxed{x = \pm 2\sqrt{2}}$$

Solve each quadratic equation by factoring. Show all work. Make sure your answer is completely simplified. Circle your final answer(s).

add mult
6.) $x^2 + 4x - 32 = 0$

$$(x+8)(x-4) = 0$$

$$x+8=0 \quad x-4=0$$
$$\frac{-8 \ -8}{} \quad \frac{+4 \ +4}{}$$
$$\boxed{x = -8} \quad \boxed{x = 4}$$

7.) $14x^2 - 16x = 0$

$$2x(7x-8) = 0$$

$$\frac{2x}{2} = \frac{0}{2} \qquad 7x-8=0$$
$$\qquad\qquad \frac{+8 \ +8}{}$$
$$\boxed{x = 0} \qquad 7x = 8$$
$$\qquad\qquad \frac{7x}{7} = \frac{8}{7}$$
$$\qquad\qquad \boxed{x = 8/7}$$

8.) $5x^2 - 3x - 2 = 0$

$$5 \cdot -2$$
$$= -10$$
$$-5 \text{ and } 2$$

$$(5x^2 - 5x) + (2x - 2) = 0$$
$$5x(x-1) + 2(x-1) = 0$$
$$(5x+2)(x-1) = 0$$

$$5x+2=0 \qquad x-1=0$$
$$\frac{-2 \ -2}{} \qquad \frac{+1 \ +1}{}$$
$$\frac{5x}{5} = \frac{-2}{5} \qquad \boxed{x = 1}$$
$$\boxed{x = -2/5}$$

Solve each quadratic equation by completing the square. Show all work. Make sure your answer is completely simplified. Circle your final answer(s).

9.) $x^2 + 10x - 3 = 0$

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

$$X^2 + 10x = 3$$

$$\left(\frac{b}{2}\right)^2 = \left(\frac{10}{2}\right)^2 = (5)^2 = 25$$

$$X^2 + 10x + 25 = 3 + 25$$

$$(x+5)(x+5) = 28$$

$$\sqrt{(x+5)^2} = \sqrt{28}$$

$$X + 5 = \pm\sqrt{28}$$

$$\underline{-5 \qquad -5}$$

$$X = \pm\sqrt{28} - 5$$

$$X = \pm\sqrt{4\cdot7} - 5 \rightarrow \boxed{X = \pm 2\sqrt{7} - 5}$$

10.) $x^2 - 20x + 91 = 0$

$$\underline{-91 \quad -91}$$

$$X^2 - 20x = -91$$

$$\left(\frac{b}{2}\right)^2 = \left(\frac{-20}{2}\right)^2 = (-10)^2 = 100$$

$$X^2 - 20x + 100 = -91 + 100$$

$$X^2 - 20x + 100 = 9$$

$$(x-10)(x-10) = 9$$

$$\sqrt{(X-10)^2} = \sqrt{9}$$

$$X - 10 = \pm\sqrt{9}$$

$$X - 10 = \pm 3$$

$$\underline{+10 \qquad +10}$$

$$X = \pm 3 + 10$$

$$X = 3 + 10 \quad \boxed{X = 13}$$
$$X = -3 + 10 \quad \boxed{X = 7}$$

Solve each quadratic equation by using the quadratic formula. Show all work. Make sure your answer is completely simplified. Circle your final answer(s).

11.) $3x^2 + x - 4 = 0$

$$a = 3$$
$$b = 1$$
$$c = -4$$

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-1 \pm \sqrt{1^2 - 4(3)(-4)}}{2(3)}$$

$$= \frac{-1 \pm \sqrt{1 + 48}}{6}$$

$$= \frac{-1 \pm \sqrt{49}}{6} = \frac{-1 \pm 7}{6}$$

$$X = \frac{-1 + 7}{6} = \frac{6}{6} = \boxed{1}$$

$$X = \frac{-1-7}{6} = -8/6 = \boxed{\frac{-4}{3}}$$

12.) $3x^2 - 6x - 5 = 0$

$$a = 3$$
$$b = -6$$
$$c = -5$$

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$X = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(3)(-5)}}{2(3)}$$

$$X = \frac{6 \pm \sqrt{36 + 60}}{6}$$

$$X = \frac{6 \pm \sqrt{96}}{6} = \frac{6 \pm \sqrt{16 \cdot 6}}{6}$$

$$= \frac{6 \pm 4\sqrt{6}}{6}$$

$$= \boxed{3 \pm 2\sqrt{6}}$$

$$= \frac{3 \pm 2\sqrt{6}}{3}$$