In order to receive full credit, you must **show all your work** and simplify your answers.

1. (10 points) Use the quadratic formula to solve each equation. Simplify the solutions completely.

(a) $3x^2 - 5x + 2 = 0$

(b) $-x^2 + 8x + 1 = 0$

(c) $2x^2 + 8x + 10 = 0$

2. (10 points) Perform the indicated operations on the complex numbers. Write the result in standard complex form, i.e., in the form $a + bi$.

(a)

$$(-2 - 3i) + (-7 - 5i)$$

(b)

$$(-2 - 3i)(-7 - 5i)$$

(c)

$$\frac{5}{3 + i}$$

(d)

$$\frac{1 + 8i}{1 - 2i}$$

3. (10 points) Algebraically find the vertex, y-intercept, and x-intercept(s) for each parabola (i.e., show the algebra for how you find the coordinates of each!), and then sketch the graph.

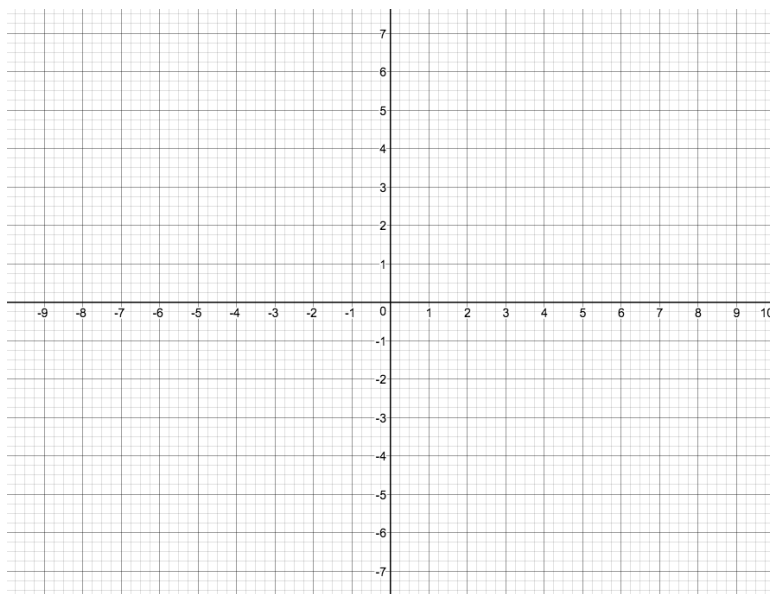Label the vertex, y-intercept, and x-intercept(s) on each graph with their coordinates.

(a)

$$y = (x + 1)^2$$

vertex:
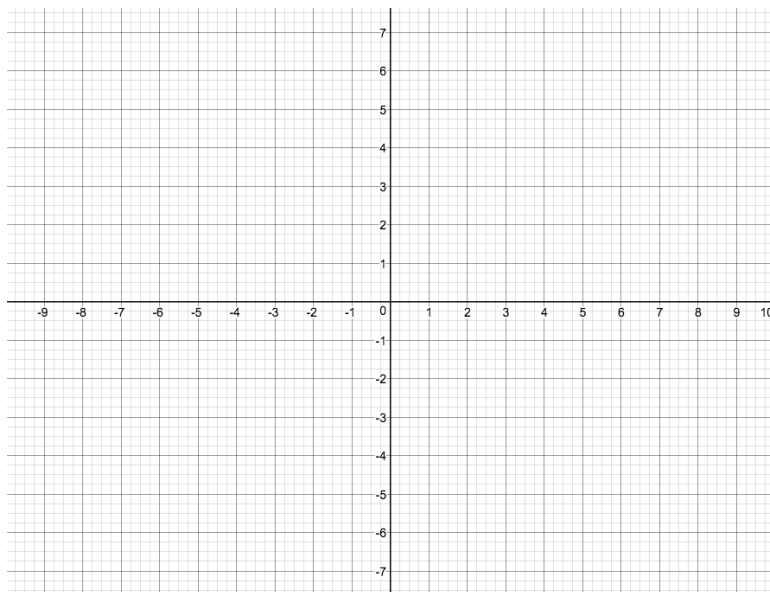
y-intercept:

x-intercept(s):

(b)

$$y = x^2 + 6x + 2$$

vertex:

y-intercept:

x-intercept(s):

4. (10 points) Identify the center and radius of the circle described by the given equation. Then sketch a graph of the circle, labelling the center and four points on the circle with their coordinates.
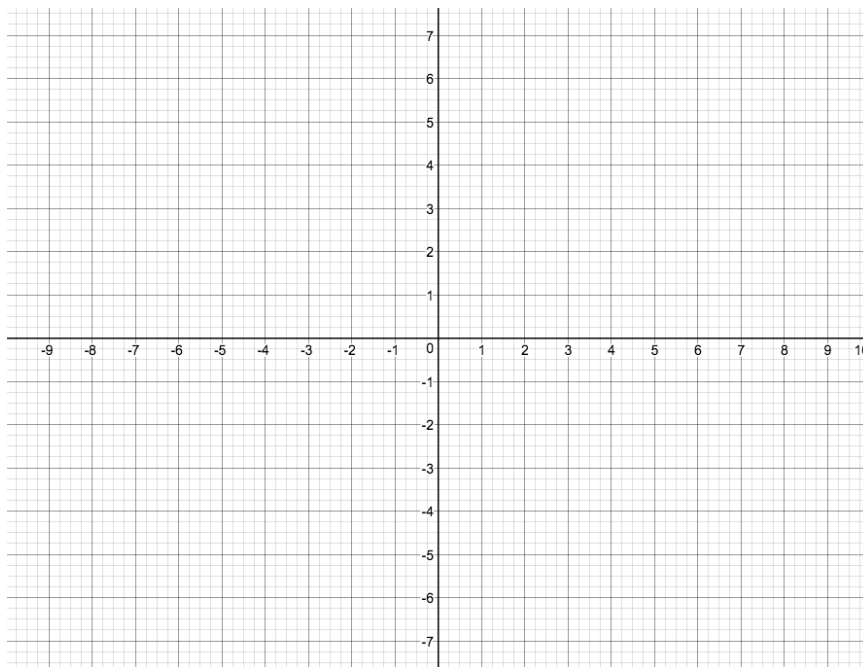
   (Recall that the standard form of the equation of a circle centered at (h, k) with radius r is $(x - h)^2 + (y - k)^2 = r^2$.)

   (a)

   $$(x + 1)^2 + (y - 3)^2 = 4$$

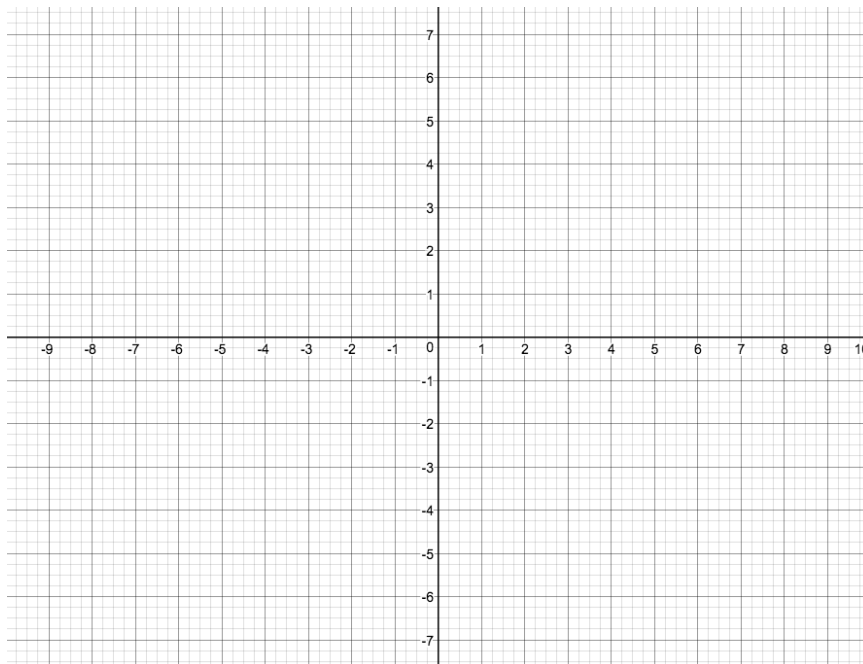   center:

         radius $r =$

   (b)

   $$x^2 + y^2 + 10x + 8y + 25 = 0$$

         center:

         radius $r =$

5. (10 points) Solve the system of equations

$$
\begin{aligned}
7x + y^2 &= 1 \tag{1}\\
x^2 - y^2 &= -11 \tag{2}
\end{aligned}
$$

according to the following steps:

(a) Use the addition method to eliminate the variable y, which will reduce the system to a single quadratic equation involving only x.

(b) Solve the quadratic equation from part (a). (You can solve by factoring or by using the quadratic formula.)

(c) For each of the x-values from part (b), solve for the corresponding value(s) of y. (You can use either of the original equations (1) or (2).)

(d) Write each of the solutions as ordered pairs (x, y).