Practice 5(10). For the circle \( x^2 - 6x + y^2 + 4y + 4 = 0 \):

(a) Find the center and radius.

(b) Find the \( x \) and \( y \)-intercepts.

Given equation: \( x^2 - 6x + y^2 + 4y + 4 = 0 \)

Write the equation in the form: \( (x - a)^2 + (y - b)^2 = r^2 \)

Get the constant on the right, group the variables together.

\[(x^2 - 6x) + (y^2 + 4y) = -4\]

Complete the square:

Divide the coefficient of \( x \) (-6) and the coefficient \( y \) (4) by 2 (\( -3 \)); square \( (x^2) \).

\[
-6 \rightarrow -3 \rightarrow x^2 \quad 4 \rightarrow 2 \rightarrow x^2 \\
(x - 3)^2 + (y + 2)^2 = 9
\]

\( (x - 3)^2 + (y - (-2))^2 = 3^2 \)

Answer: (a) center = (3, -2), radius = 3.

(b) x-intercept (set \( y = 0 \)): Use the original equation.

\[ x^2 - 6x + (0)^2 + 4(0) + 4 = 0 \]

\[ x^2 - 6x + 4 = 0 \]

Try factoring first. Then try the quadratic formula.

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{6^2 - 4(1)(4)}}{2} = \frac{6 \pm \sqrt{20}}{2}
\]

\[
\frac{6 \pm \sqrt{20}}{2} = 3 \pm \sqrt{5}
\]

Answer: x-intercepts: \( x = 3 \pm \sqrt{5} \)

y-intercept (set \( x = 0 \)): \(-2\)

\[ (0)^2 - 6(0) + y^2 + 4y + 4 = 0 \]

\[ y^2 + 4y + 4 = 0 \]

\[ (y + 2)(y + 2) = 0 \]

Answer: y-intercept: \( y = -2 \)

Practice 6(4). Find the equation for the line through (-1, 4) and (4, -2). Write the equation in the form \( y = mx + b \).

Given: \( (x_1, y_1) = (-1, 4) \)

\( (x_2, y_2) = (4, -2) \)

Slope: \( m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - (-2)}{(-1) - 4} = \frac{6}{-5} = -\frac{6}{5} \)

Equation:

\[
y - y_1 = m(x - x_1) \\
y - 4 = -\frac{6}{5}(x - (-1)) \\
y = -\frac{6}{5}(x + 1) + 4 \\
y = -\frac{6}{5}x - \frac{6}{5} + \frac{20}{5} \\
y = -\frac{6}{5}x + \frac{14}{5}
\]

Answer: \( y = -\frac{6}{5}x + \frac{14}{5} \)