

1. a. Write the equation of this circle in **general** form: $y^2 + x^2 - 1 = -4x + 4y$

$$x^2 + y^2 + 4x - 4y - 1 = 0$$

- b. Now write that equation in **standard** form.

$$x^2 + 4x + 4 + y^2 - 4y + 4 = 1 + 4 + 4$$

$$(x+2)^2 + (y-2)^2 = 9$$

2. What is the slope of a line parallel and perpendicular to a line with a slope of $-5/6$?

$$m_{\parallel} = -\frac{5}{6}$$

$$m_{\perp} = \frac{6}{5}$$

3. A side of a **square** has coordinates x_1, y_1 and x_2, y_2 $(-3, 2)$ and $(2, 5)$. What is the perimeter of the square?

Use distance formula to find the length of 1 side of square

$$d = \sqrt{(2-(-3))^2 + (5-2)^2} = \sqrt{5^2 + 3^2} = \sqrt{25+9} = \sqrt{34}$$

$$\text{Perimeter} = \sqrt{34} (4) = 4\sqrt{34}$$

4. Determine if the following points are inside, outside, or on the circle $(x-2)^2 + (y+3)^2 = 220$?

a. $(-8, 8)$ **outside**

$$(-8-2)^2 + (8+3)^2 = 220$$

$$100 + 121 = 220$$

$$221 > 220$$

$$LS > RS$$

b. $(4, -13)$

$$(4-2)^2 + (-13+3)^2 = 220$$

$$4 + 100 = 220$$

$$104 < 220$$

$$LS < RS$$

c. $(-9, -2)$

$$(-9-2)^2 + (-2+3)^2 = 220$$

$$121 + 1 = 220$$

$$122 < 220$$

$$LS < RS$$

5. Find the slope, distance, and midpoint of $(21, 5)$ and $(5, 7)$.

Slope: $-\frac{1}{8}$

$$m = \frac{7-5}{5-21} = \frac{2}{-16} = -\frac{1}{8}$$

Distance: $2\sqrt{65}$

$$d = \sqrt{(5-21)^2 + (7-5)^2}$$

$$\sqrt{256+4}$$

$$\sqrt{260} = \sqrt{4 \cdot 65} = 2\sqrt{65}$$

Midpoint: $(13, 6)$

$$\text{Midpoint} = \left(\frac{21+5}{2}, \frac{5+7}{2} \right)$$

$$= \left(\frac{26}{2}, \frac{12}{2} \right)$$

6. Find the perpendicular slope of $(12, 4)$ and $(18, 12)$.

$$m = \frac{12-4}{18-12} = \frac{8}{6} = \frac{4}{3}$$

$$\perp m = -\frac{3}{4}$$

7. Write the equation of this circle in general form: $(x-1)^2 + (y+2)^2 = 9$

$$(x-1)(x-1) + (y+2)(y+2) = 9$$

$$x^2 - x - x + 1 + y^2 + 2y + 2y + 4 - 9 = 0$$

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

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

8. Write the equation of this circle in standard form: $y^2 + 8y = -12 - x^2$

Then find the center and radius.

$$x^2 + y^2 + 8y + 16 = -12 + 16$$

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

Equation: $x^2 + (y+4)^2 = 4$

Center: $(0, -4)$

Radius: 2

9. What is the equation of a circle that has a center $(8, 12)$ and a point on the circle at $(2, -4)$?

$$d = \sqrt{(2-8)^2 + (-4-12)^2}$$

$$= \sqrt{36 + 256} = \sqrt{292}$$

$$(x-8)^2 + (y-12)^2 = (\sqrt{292})^2$$

$$(x-8)^2 + (y-12)^2 = 292$$

10. What is the equation of a circle that has endpoints of a diameter at $(-2, 1)$ and $(5, 5)$?

① Find Midpoint
 $(\frac{-2+5}{2}, \frac{1+5}{2})$

② Find distance between center & 1 point on circle

$$d = \sqrt{(1.5-2)^2 + (3-1)^2}$$

$$= \sqrt{(0.5)^2 + 2^2} = \sqrt{16.25}$$

③ $(x-h)^2 + (y-k)^2 = r^2$

$$(x-1.5)^2 + (y-3)^2 = 16.25$$

Center: $(1.5, 3)$

Write the equation for a line that is parallel to the given line and contains the following points.

11. $x = -7$ Contains the point $(3, 8)$

↳ Vertical line

use x-value for equation

equation: $x = 3$

12. $3y = \frac{x}{3} + \frac{15}{3}$ Contains the point $(-3, 10)$

$$y = \frac{1}{3}x + 5$$

$$m = \frac{1}{3}$$

$$y = mx + b$$

$$10 = \frac{1}{3}(-3) + b$$

$$10 = -1 + b$$

$$11 = b$$

equation: $y = \frac{1}{3}x + 11$

Write the equation for a line that is perpendicular to the given line and contains the following points.

13. $5x - 3y = 6$

$$m = \frac{5}{3}$$

Contains the point $(5, -6)$

$$\perp m = -\frac{3}{5}$$

$$-6 = (-\frac{3}{5})(5) + b$$

$$-6 = -3 + b$$

$$-3 = b$$

equation: $y = -\frac{3}{5}x - 3$

↳ Solve for y

$$5x - 3y = 6$$

$$\begin{array}{r} 5x - 3y = 6 \\ -5x = -5x \\ \hline -3y = -5x + 6 \\ = -3 \end{array}$$

$$y = \frac{5}{3}x - 2$$

$$m = \frac{5}{3}$$

14. $y = 4$ Contains the point $(-5, -7)$

↳ Horizontal line
use the x-value

equation: $x = -5$