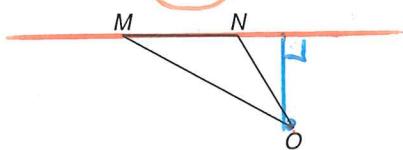
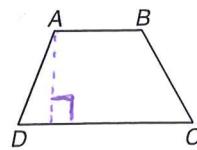
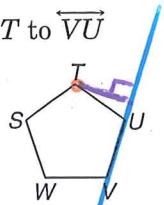
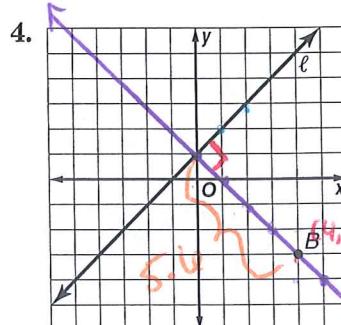
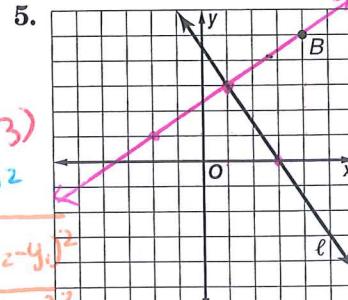


**3-6 Practice****Perpendiculars and Distance**

Draw the segment that represents the distance indicated.

1.  $O$  to  $\overleftrightarrow{MN}$ 2.  $A$  to  $\overrightarrow{DC}$ 3.  $T$  to  $\overleftrightarrow{VU}$ Construct a line perpendicular to  $\ell$  through  $B$ . Then find the distance from  $B$  to  $\ell$ .

$$\begin{aligned} & \text{Slope of } \ell = 1 \\ & \text{Slope of perpendicular line} = -1 \\ & \text{Equation of perpendicular line: } y = -x + 1 \\ & \text{Point } B(4, -3) \text{ is on the line } y = -x + 1. \\ & d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ & d = \sqrt{(4 - 0)^2 + (-3 - 1)^2} \\ & d = \sqrt{16 + 16} = \sqrt{32} = 5.6 \end{aligned}$$



$$\begin{aligned} & \text{Slope of } \ell = \frac{5}{4} \\ & \text{Slope of perpendicular line} = -\frac{4}{5} \\ & \text{Equation of perpendicular line: } y = -\frac{4}{5}x + 1 \\ & \text{Point } B(1, 3) \text{ is on the line } y = -\frac{4}{5}x + 1. \\ & d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ & d = \sqrt{(4 - 1)^2 + (5 - 3)^2} \\ & d = \sqrt{3^2 + 2^2} \\ & d = \sqrt{9 + 4} \\ & d = \sqrt{13} \\ & d = 3.6 \end{aligned}$$

Find the distance between each pair of parallel lines.

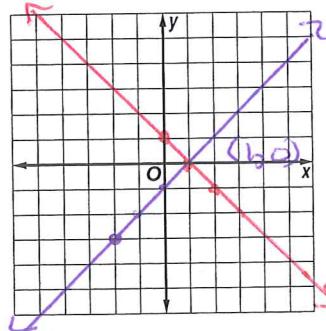
$$\begin{aligned} 6. \quad y &= -x \\ y &= -x - 4 \end{aligned}$$

$$\begin{aligned} 7. \quad y &= 2x + 7 \\ y &= 2x - 3 \end{aligned}$$

$$\begin{aligned} 8. \quad y &= 3x + 12 \\ y &= 3x - 18 \end{aligned}$$

9. Graph the line  $y = -x + 1$ . Construct a perpendicular segment through the point at  $(-2, -3)$ . Then find the distance from the point to the line.

$$\begin{aligned} & \text{Point } (-2, -3) \text{ is on the line } y = -x + 1. \\ & \text{Slope of perpendicular line} = 1 \\ & \text{Equation of perpendicular line: } y = x + 1 \\ & d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ & d = \sqrt{(-2 - 0)^2 + (-3 - 1)^2} \\ & d = \sqrt{4 + 16} = \sqrt{20} = 4.47 \end{aligned}$$



10. CANOEING Bronson and a friend are going to carry a canoe across a flat field to the bank of a straight canal. Describe the shortest path they can use.

⑥

- ①  $y = -x$   $(0,0) *$
- ②  $y = -x - 4$   $(0,-4)$

Step 1: Find the equation for a perpendicular line

$$m = \frac{-1}{1} \Rightarrow -\frac{1}{2}$$

$$(0, 0)$$

$$y - y_1 = m(x - x_1)$$

$$y - 0 = -\frac{1}{2}(x - 0)$$

$$\boxed{y = -\frac{1}{2}x + 7}$$

⑦

- ①  $y = 2x + 7$
- ②  $y = 2x - 3$

$$m = \frac{3}{1} \Rightarrow \frac{1}{2}$$

$$(0, 7)$$

$$y - 7 = \frac{1}{2}(x - 0)$$

$$y - 7 = \frac{1}{2}x$$

$$y = \frac{1}{2}x + 7$$

$$2x + 3 = \cancel{\frac{1}{2}x} + 7$$

$$+\cancel{\frac{1}{2}x} + \cancel{\frac{1}{2}x} + 3$$

$$2.5x = 10$$

$$x = 4$$

$$y = 2(4) - 3$$

$$y = 8 - 3$$

$$y = 5$$

$$(4, 5)$$

Step 2: Use systems of equations to solve for intersection point.

$$(-2, -2)$$

$$x_2 \quad y_2$$

Step 3: Use distance formula w/ 2 points

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(-2 - 0)^2 + (-2 - 0)^2}$$

$$= \sqrt{(-2)^2 + (-2)^2}$$

$$= \sqrt{4 + 4}$$

$$= \sqrt{8}$$

$$= 2\sqrt{2}$$

$$① y = -x - 4$$

$$② y = \cancel{x}$$

$$x = -\cancel{x} - 4$$

$$+x$$

$$\cancel{2}x = \frac{-4}{2}$$

$$x = -2$$

$$y = -2$$

$$(0, 7) \quad (4, 5)$$

$$x_1 \quad y_1 \quad x_2 \quad y_2$$

$$d = \sqrt{(4 - 0)^2 + (5 - 7)^2}$$

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

$$= \sqrt{16 + 4}$$

$$= \sqrt{20} = \boxed{4.47}$$

$$⑧ \quad y = 3x + 12 \quad y = 3x - 18$$

$$y = 3x - 18$$

$$y = -\frac{1}{3}x + 12$$

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

$$(0, 12)$$

$$y - 12 = -\frac{1}{3}(x - 0)$$

$$\cancel{\frac{1}{3}}x = 30(\frac{3}{10})$$

$$y - 12 = -\frac{1}{3}x$$

$$x = 9$$

$$y = -\frac{1}{3}x + 12$$

$$y = 3(9) - 18$$

$$y = 27 - 18$$

$$y = 9$$

$$(9, 9)$$

$$d = \sqrt{(9 - 0)^2 + (9 - 12)^2}$$

$$= \sqrt{9^2 + (-3)^2}$$

$$\sqrt{81 + 9} = \sqrt{90} = 9.5$$