Name _____ Date _____

Distance Point to Line & Between Parallel Lines

Find the distance from the given point to the given line.

1. Point (-6, 4) and line $y = \frac{1}{3}x - 4$

$m = \frac{1}{3}$ $\quad 4 = -3(-6) + b$ $\quad \frac{1}{3}x - y = -3x - 14$

$\perp_m = -3$ $\quad 4 = 18 + b$ $\quad \frac{10}{3}x = -10$

$-14 = b$ $\quad x = -3$

$y = -3x - 14$ $\quad y = -5$

dist $(-6, 4)\ (-3, -5)$

$\sqrt{(-3+6)^2 + (-5-4)^2}$

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

$9 + 81$

$\sqrt{90}$ $\quad \approx 9.5$

2. Point $(-\frac{1}{4}, 5)$ and line $-x + 2y = 14$

$y = \frac{1}{2}x + 7$ $\quad 5 = -2(-\frac{1}{4}) + b$ $\quad \frac{1}{2}x + 7 = -2x + \frac{9}{2}$

$m = \frac{1}{2}$ $\quad 5 = \frac{1}{2} + b$ $\quad \frac{5}{2}x = -\frac{5}{2}$

$\perp_m = -2$ $\quad \frac{9}{2} = b$ $\quad x = -1$

$y = -2x + \frac{9}{2}$ $\quad y = \frac{13}{2}$

dist $(-\frac{1}{4}, 5)\ (-1, \frac{13}{2})$

$\sqrt{(-1+\frac{1}{4})^2 + (\frac{13}{2} - 5)^2}$

$(-\frac{3}{4})^2 + (\frac{3}{2})^2$

$.5625 + 2.25$ $\quad \approx 1.7$

Find the distance between the given parallel lines.

3. $y = -\frac{1}{3}x + 2,\ y = -\frac{1}{3}x - 8$

$x = 0 \quad y = 2$ $\quad 2 = 3(0) + b$ $\quad -\frac{1}{3}x - 8 = 3x + 2$

$\perp_m = 3$ $\quad 2 = b$ $\quad -10 = \frac{10}{3}x$

$y = 3x + 2$ $\quad -3 = x$

$y = -7$

dist $(0, 2)\ (-3, -7)$

$\sqrt{(-3-0)^2 + (-7-2)^2}$

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

$9 + 81$

$\sqrt{90}$ $\quad \approx 9.5$

4. $y = .4x + 9,\ y = 4x - 8$

$x = 0 \quad y = 9$ $\quad 9 = -\frac{1}{4}(0) + b$ $\quad 4x - 8 = -\frac{1}{4}x + 9$

$\perp_m = -\frac{1}{4}$ $\quad 9 = b$ $\quad \frac{17}{4}x = 17$

$y = -\frac{1}{4}x + 9$ $\quad x = 4$

$y = 8$

dist $(0, 9)\ (4, 8)$

$\sqrt{(4-0)^2 + (8-9)^2}$

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

$16 + 1$

$\sqrt{17}$ $\quad \approx 4.1$

Find the distance from the given point to the given line.

5. Point (-6, 8) to the line y = -3x + 10

$m_\perp = \frac{1}{3}$ $\quad 8 = \frac{1}{3}(-6) + b$ $\quad 8 = -2 + b$ $\quad 10 = b$ $\quad y = \frac{1}{3}x + 10$

$-3x + 10 = \frac{1}{3}x + 10$ $\quad -\frac{10}{3}x = 0$ $\quad x = 0$ $\quad y = 10$

dist (-6, 8) (0, 10)

$\sqrt{(10-8)^2 + (0-(-6))^2}$

$(2)^2 + (6)^2$

$4 + 36$

$\sqrt{40}$

≈ 6.3

6. point (3, 8) to the line $y = \frac{1}{5}x - 3$.

$m_\perp = -5$ $\quad 8 = -5(3) + b$ $\quad 8 = -15 + b$ $\quad 23 = b$ $\quad y = -5x + 23$

$\frac{1}{5}x - 3 = -5x + 23$ $\quad \frac{26}{5}x = 26$ $\quad x = 5$ $\quad y = -2$

dist (3, 8) (5, -2)

$\sqrt{(-2-8)^2 + (5-3)^2}$

$(-10)^2 + (2)^2$

$100 + 4$

$\sqrt{104}$

≈ 10.2

Find the distance between the given parallel lines.

7. Line #1: y = 3x + 2
Line #2: y = 3x - 2

$x = 0$ $\quad y = 2$ $\quad m_\perp = -\frac{1}{3}$

$2 = -\frac{1}{3}(0) + b$ $\quad 2 = b$ $\quad y = -\frac{1}{3}x + 2$

$3x - 2 = -\frac{1}{3}x + 2$ $\quad \frac{10}{3}x = 4$ $\quad x = \frac{6}{5}$

$y = \left(-\frac{1}{3}\right)\left(\frac{6}{5}\right) + 2$ $\quad y = -\frac{2}{5} + 2$ $\quad y = \frac{8}{5}$

dist $(0, 2)$ $\left(\frac{6}{5}, \frac{8}{5}\right)$

$\sqrt{(1.6-2)^2 + (1.2-0)^2}$

$(-.4)^2 + (1.2)^2$

$.16 + 1.44$

$\sqrt{1.6}$

≈ 1.3

8. *Line* 1: $y = -\frac{2}{3}x - 7$

Line 1: $y = -\frac{2}{3}x + 1$

$x = 0$ $\quad y = -7$ $\quad m_\perp = \frac{3}{2}$

$-7 = \frac{3}{2}(0) + b$ $\quad -7 = b$ $\quad y = \frac{3}{2}x - 7$

$-\frac{2}{3}x + 1 = \frac{3}{2}x - 7$ $\quad 8 = \frac{3}{2}x + \frac{2}{3}x$ $\quad \frac{9}{6} \quad \frac{4}{6}$ $\quad 8 = \frac{13}{6}x$ $\quad \frac{48}{13} = x$ $\quad y = -\frac{19}{13}$

$y = \frac{3}{2}\left(\frac{48}{13}\right) - 7$ $\quad \frac{72}{13} - 7$ $\quad y \; \frac{72}{13} - \frac{91}{13}$

dist $(0, -7)$ $\left(\frac{48}{13}, -\frac{19}{13}\right)$

$\sqrt{\left(-\frac{19}{13} - -7\right)^2 + \left(\frac{48}{13} - 0\right)^2}$

$(.67)^2 + (3.69)^2$

$.4489 + 13.6161$

$\sqrt{14.065}$

≈ 3.8