Answers

Math 436 Straight Lines II – More Review

1. The equation of line l_1 is $y = -\frac{1}{3}x + \frac{3}{4}$, $\} m = -\frac{1}{3}$

and the equation of line l_2 is $y = 3x + \frac{2}{3}$. $\} m = 3$

Which of the following statements is true? Circle the right answer.

a) l_1 is perpendicular to l_2.
b) l_1 is parallel to l_2.
c) l_1 coincides with l_2.
d) l_1 is neither perpendicular nor parallel to l_2.

2. Determine the equation of the line (l_2) that passes through point (-2,0) and that is parallel to the line whose equation is $x + \frac{y}{3} = -1$ (l_1). Show each step in the solution.

l_1

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

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

$\frac{3}{1}\left(\frac{1}{3}y\right) = 3(-x-1)$

$y = \underset{m}{-3}x - 3$

l_2 $\quad x \quad y$

$m = -3 \quad (-2, 0)$

$y = mx + b$

$0 = (-3)(-2) + b$

$0 = 6 + b$

$-6 = b$

Equation l_2:

$y = -3x - 6$

3. What is the equation of the line (l_2) that passes through point $(\frac{2}{3}, \frac{1}{4})$ and that is perpendicular to the line whose equation is $\frac{2x}{3} = \frac{-y}{4}$ (l_1).

Show each step in the solution.

l_1

$\frac{2}{3}x = -\frac{1}{4}y$

$\frac{1}{4}y = -\frac{2}{3}x$

$\frac{4}{1}\left(\frac{1}{4}y\right) = \frac{4}{1}\left(-\frac{2}{3}x\right)$

$y = \underset{m}{\left(-\frac{8}{3}\right)}x$

l_2 $\quad m = \frac{3}{8}$

$y = mx + b$

$\frac{1}{4} = \left(\frac{3}{8}\right)\left(\frac{2}{3}\right) + b$

$\frac{1}{4} = \frac{6}{24} \quad \div 6$

$\frac{1}{4} = \frac{1}{4} + b$

$0 = \frac{1}{4} - \frac{1}{4} = b$

Eqn l_2

$y = \frac{3}{8}x$

For ⊥ lines: $m_1 \cdot m_2 = -1$

$\left(\frac{1}{2}\right)\cdot\left(\frac{-2}{1}\right) = -1$

4. **The equation of a given line is $y = -2x + 2$.**
Which of the following lines is perpendicular to it? Circle the right answer.

a) $y = 2x + 2$
b) $y = -2x - \frac{1}{2}$
c) $y = -\frac{1}{2}x + 2$
d) $y = \frac{1}{2}x + 2$

5. **Determine the equation of a line that passes through point (-1, 6.5) and which is parallel to another line whose equation is $x + 4y + 4 = 0$. Show each step in the solution.**

l_1

$x + 4y + 4 = 0$

$\frac{4y}{4} = \frac{-x}{4} - \frac{4}{4}$

$y = \left(-\frac{1}{4}\right)x - 1$

m

l_2 $m = -\frac{1}{4}$ $(-1, 6.5)$ (x, y)

$y = mx + b$

$6.5 = \left(-\frac{1}{4}\right)(-1) + b$

$6\frac{1}{2} = \frac{1}{4} + b$

$6\frac{1}{2} - \frac{1}{4} = b$

$\frac{13\cdot 2}{2\cdot 2} - \frac{1}{4} = b$

$\frac{25}{4} = \frac{26}{4} - \frac{1}{4} = b$

Eqn l_2 :

$y = -\frac{1}{4}x + \frac{25}{4}$

6. **A line passes through the point $\left(\frac{1}{6}, \frac{1}{4}\right)$. Determine the equation of this line if it is perpendicular to another line whose equation is $\frac{2}{3}x = 2y - 1$.**

l_1

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

$\left(-\frac{1}{2}\right)(-2y) = \left(-\frac{1}{2}\right)\left(-\frac{2}{3}x - 1\right)$

$y = \frac{2}{6}x + \frac{1}{2}$

$y = \left(\frac{1}{3}\right)x + \frac{1}{2}$

m

l_2 $m = -3$ $\left(\frac{1}{6}, \frac{1}{4}\right)$ (x, y)

$y = mx + b$

$\frac{1}{4} = \left(\frac{-3}{1}\right)\left(\frac{1}{6}\right) + b$

$\frac{1}{4} = -\frac{3}{6} + b$

$\frac{1}{4} = -\frac{1}{2} + b$

$\frac{1}{4} + \frac{1\cdot 2}{2\cdot 2} = b$

$\frac{1}{4} + \frac{2}{4} = b$

$\frac{3}{4} = b$

EQN l_2:

$y = -3x + \frac{3}{4}$

7. **What is the equation of the line that passes through point $\left(\frac{3}{4}, \frac{2}{3}\right)$ and that is perpendicular to the line whose equation is $\frac{3x}{4} = \frac{-y}{3}$? Show each step in the solution.**

l_1

$\frac{3}{4}x = -\frac{1}{3}y$

$\frac{3}{1}\left(\frac{1}{3}y\right) = \frac{3}{1}\left(-\frac{3}{4}x\right)$

$y = \left(\frac{-9}{4}\right)x$

m

l_2 $m = \frac{4}{9}$

$\left(\frac{3}{4}, \frac{2}{3}\right)$ (x, y)

$y = mx + b$

$\frac{2}{3} = \left(\frac{4}{9}\right)\left(\frac{3}{4}\right) + b$

$\frac{2}{3} = \frac{1}{3} + b$

$\frac{2}{3} - \frac{1}{3} = b$

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

Eqn l_2

$y = \frac{4}{9}x + \frac{1}{3}$

$m=2$ $m=2$

8. **The equation of line l_1 is $y = 2x - \frac{1}{2}$ and the equation of line l_2 is $y = 2x + 2$. Which of the following statements is true? Circle the right answer.**

a) l_1 is perpendicular to l_2
b) l_1 is parallel to l_2
c) l_1 coincides with l_2
d) l_1 is neither perpendicular nor parallel to l_2

9. **Determine the equation of the line passing through point (-1, 0) and that is parallel to the line whose equation is $x + \frac{y}{5} = -2$.**

l_1

$x + \frac{1}{5}y = -2$

$\frac{5}{1}\left(\frac{1}{5}y\right) = \frac{-5}{1}(-x - 2)$

$y = (-5)x - 10$

m

l_2 $m = -5$ $(-1, 0)$ x y

$y = mx + b$

$0 = (-5)(-1) + b$

$0 = 5 + b$

$-5 = b$

Eqn l_2

$y = -5x - 5$

10. **Determine the equation of the line passing through point $(-\frac{1}{5}, \frac{5}{6})$ and that is perpendicular to the line whose equation is $\frac{3x}{5} = \frac{-y}{2}$. Show each step in the solution.**

l_1

$\frac{3}{5}x = \frac{-1}{2}y$

$\frac{2}{1}\left(\frac{1}{2}y\right) = \frac{-2}{1}\left(\frac{3}{5}x\right)$

$y = \left(\frac{-6}{5}\right)x$

m

l_2 x y

$m = \frac{5}{6}$ $\left(-\frac{1}{5}, \frac{5}{6}\right)$

$y = mx + b$

$\frac{5}{6} = \left(\frac{5}{6}\right)\left(\frac{-1}{5}\right) + b$

$\frac{5}{6} = \frac{-5}{30} + b$ $\div 5$

$\frac{5}{6} = \frac{-1}{6} + b$

$1 = \frac{6}{6} = \frac{5}{6} + \frac{1}{6} = b$

Eqn l_2

$y = \frac{5}{6}x + 1$