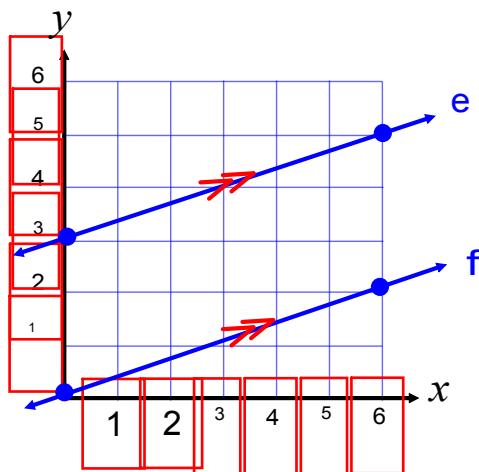


Parallel and Perpendicular Lines

Nov. 11/2015

Lines 'e' and 'f' are parallel, which means they will never cross. Calculate and compare their slopes.

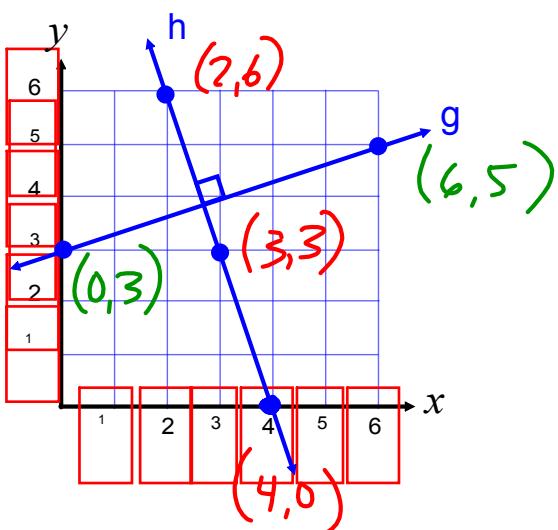


$$m_e = \frac{2}{6} \\ = \frac{1}{3}$$

$$m_f = \frac{2}{6} \\ = \frac{1}{3}$$

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Lines 'g' and 'h' are perpendicular, which means they meet at a right angle. Calculate and compare their slopes.



$$m_g = \frac{2}{6} \\ = \frac{1}{3}$$

$$m_h = \frac{-6}{2} \\ = \frac{-3}{1} \\ = -3$$

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Summary:

(1) The slopes of parallel lines are the same.

Test: $m_1 = m_2$

(2) The slopes of perpendicular lines are negative reciprocals of each other.
(i.e., flipped fractions with opposite signs)

Test: $(m_1)(m_2) = -1$

Note: Slopes can be represented as fractions or decimals, and can look different but may be equal.
Look carefully!

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Ex. For each pair of lines, determine whether they are parallel, perpendicular, or neither.

(a) $y = \frac{-1}{2}x + 4$ and $y = 2x + 1$

(b) $y = 5 + \frac{2}{3}x$ and $y = 1 - \frac{2}{3}x$

(c) $y = 4$ and $y = \frac{-1}{4}$

(d) $10x + 2y = 7$ and $3x + 15y = 10$

Apr 5-7:26 PM

$$(a) \ y = -\frac{1}{2}x + 4 \text{ and } y = 2x + 1$$

$$m_1 = -\frac{1}{2}$$

$$m_2 = 2$$

$$= \frac{2}{1}$$

neg.
reciprocal

\therefore perpendicular

$$\text{check: } (m_1)(m_2)$$

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

$$= -1 \quad \checkmark$$

Nov 10-10:42 PM

$$(b) \ y = 5 + \frac{2}{3}x \text{ and } y = 1 - \frac{2}{3}x$$

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

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

$$m_1 = \frac{2}{3}$$

$$m_2 = -\frac{2}{3}$$

neither

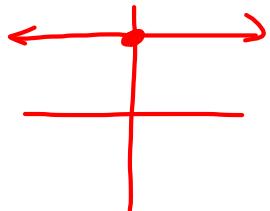
$$\frac{2}{3} \neq -\frac{2}{3}$$

$$\left(\frac{2}{3}\right)\left(-\frac{2}{3}\right) = -\frac{4}{9} \neq -1$$

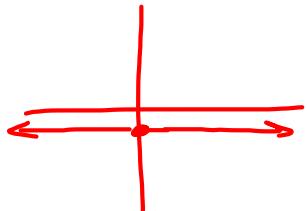
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$$(c) \quad y = 4 \quad \text{and} \quad y = -\frac{1}{4}$$

$$y = 0x + 4$$



$$y = 0x - \frac{1}{4}$$



$$m_1 = 0$$

$$m_2 = 0$$

Since $\therefore m_1 = m_2$
 \therefore parallel

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$$(d) \quad 10x + 2y = 7 \quad \text{and} \quad 3x + 15y = 10$$

$$y = mx + b$$

$$10x + 2y = 7$$

$$\frac{2y}{2} = \frac{-10x + 7}{2}$$

$$y = -5x + \frac{7}{2}$$

$$\boxed{m_1 = -5}$$

$$3x + 15y = 10$$

$$\frac{15y}{15} = \frac{-3x + 10}{15}$$

$$y = \frac{-3}{15}x + \frac{10}{15}$$

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

$$\boxed{m_2 = -\frac{1}{5}}$$

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

not \perp

 \therefore neither

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Assigned Work:

p.328 # 1-2 (no graphs), 3-5(odd), 8, 9, 11

letters

||ab

4

5

9

lc

2c

$$1. (c) \quad x + y = 4 \quad ① \quad y = 1x - 3 \quad ②$$

$$y = -1x + 4 \quad m_2 = 1$$

$$m_1 = -1$$

$$m_1 \neq m_2 \quad (\text{not parallel})$$

parallel



$$(m_1)(m_2) = (-1)(1)$$

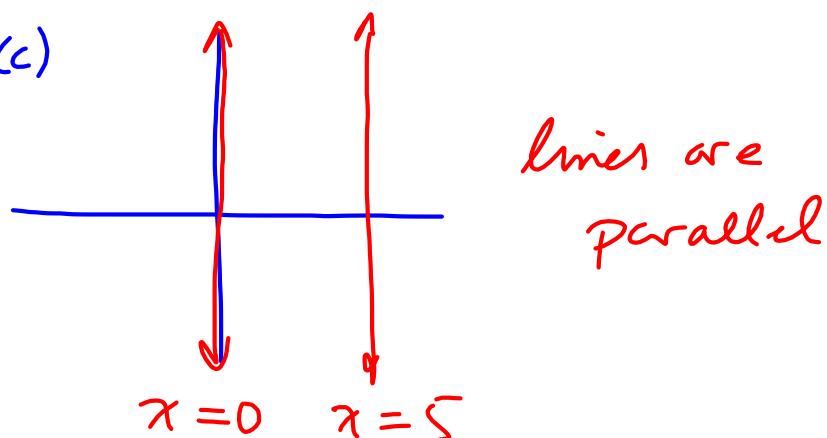
$$= -1$$

\therefore the lines are
perpendicular.

\perp or \perp

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2(c)



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4, 5

$$4. (a) \quad y = \frac{3}{5}x - 2$$

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

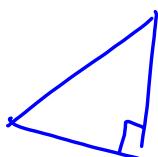
$$5. \quad m_1 = \frac{3}{5} \quad m_{\perp} = -\frac{5}{3}$$

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9, 11ab

$$9. (a) \quad A(1, 1) \quad B(-2, 5) \quad C(3, -2)$$

$$\begin{aligned} m_{AB} &= \frac{y_B - y_A}{x_B - x_A} & m_{BC} &= \frac{(-2) - (5)}{(3) - (-2)} \\ &= \frac{(5) - (1)}{(-2) - (1)} & &= \frac{-7}{5} \\ &= \frac{4}{-3} & m_{AC} &= \frac{(-2) - (1)}{(3) - (1)} \\ &= -\frac{4}{3} & &= \frac{-3}{2} \end{aligned}$$



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$$\text{II. } 4x + y - 8 = 0$$

$$y\text{-int} = 8$$

$$x\text{-int} = 2$$

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

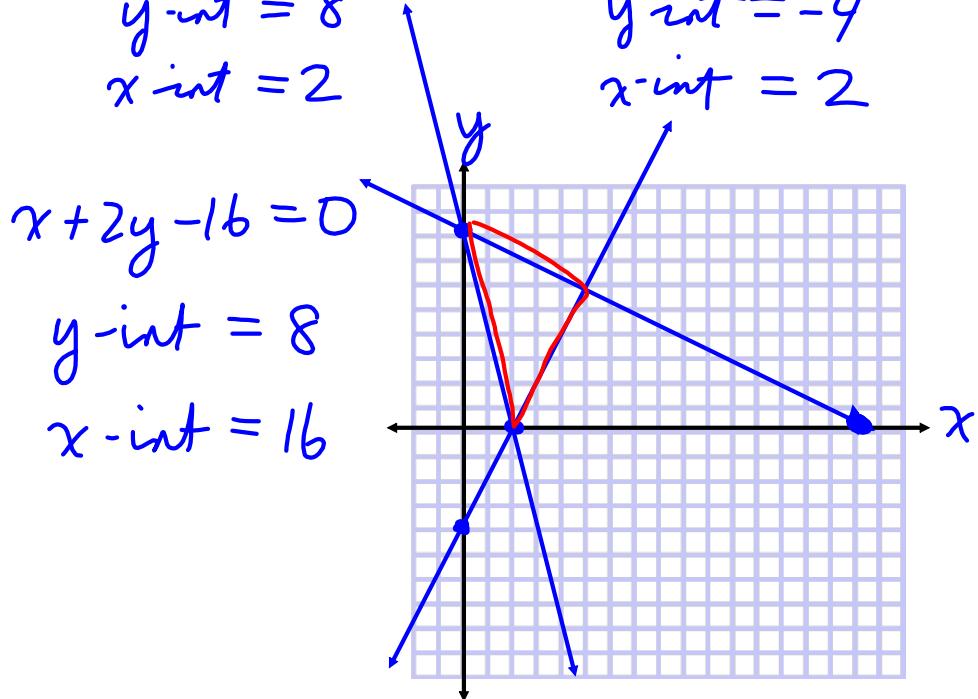
$$y\text{-int} = -4$$

$$x\text{-int} = 2$$

$$x + 2y - 16 = 0$$

$$y\text{-int} = 8$$

$$x\text{-int} = 16$$



Nov 12-10:42 AM