2.4 Slopes of Parallel and Perpendicular Lines

Monday, September 23, 2019 7:46 AM

Warm Up

Find the slope of each set of points.

(3,6), (9,11) $\frac{5}{6}$

(3,7), (13,2) $\frac{-5}{10}$ $-\frac{1}{2}$

(6,9), (-11,13) $\frac{4}{-17}$

(7,-5), (-9,-2) $\frac{3}{-16}$

(5,5), (-7,-16) $\frac{-21}{-12}$ $\frac{7}{4}$

(-4,9), (-3,-7) $\frac{-16}{1}$ -16

Essential Question

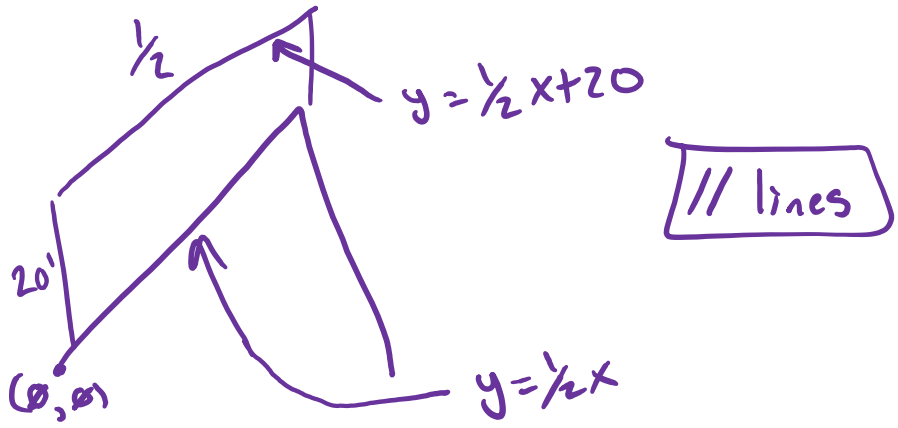
How do the slopes of lines that are parallel to each other compare? How do the slopes of lines that are perpendicular to each other compare?

Goal: "I can. . .

Use slope to solve problems about parallel and perpendicular lines."

Example 1

A hill and a gondola line 20 ft above the ground that goes up the hill both have slope $\frac{1}{2}$. What is the geometric relationship between the hill and the gondola line?



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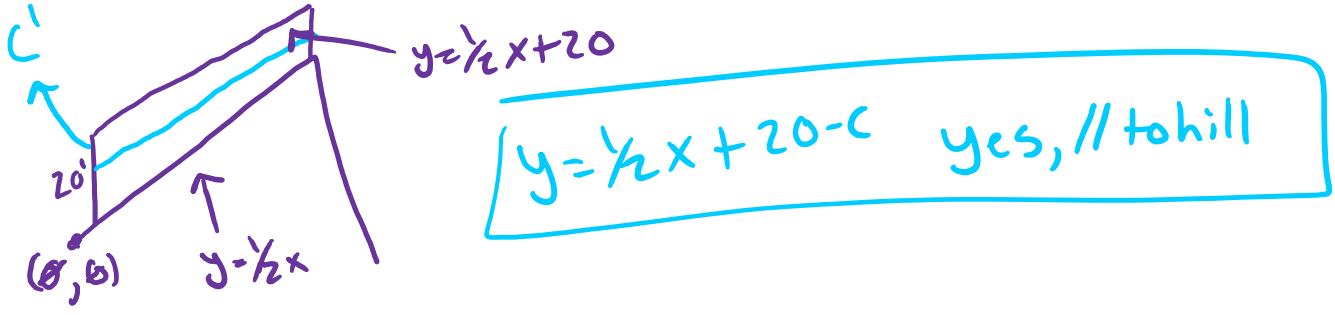
1. Suppose another line for a chair lift is placed at a constant distance c below the gondola line. What is an equation of the new line? Is the new line also parallel to the hill? Explain.

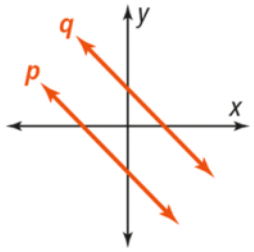


Two non-vertical lines are parallel if and only if their slopes are equal.

Any two vertical lines are parallel.

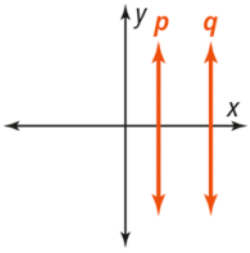
PROOF: SEE LESSON 7-5.

If... p and q are both not vertical



Then... $p \parallel q$ if and only if the slope of line p = slope of line q

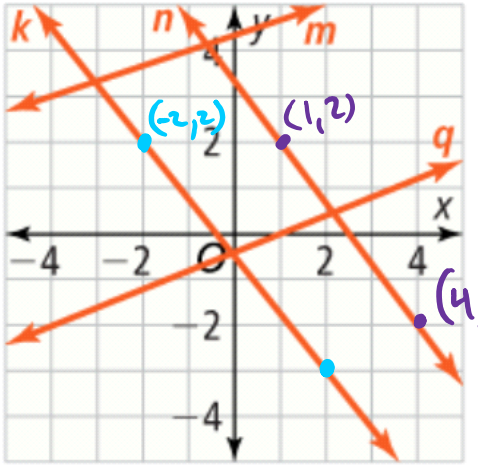
If... p and q are both vertical



Then... $p \parallel q$

Example 2

Are lines k and n parallel?



line K (-2, 2) (2, -3)

$\frac{-5}{4}$

line n (1, 2) (4, -2)

$\frac{-4}{3}$

Not //

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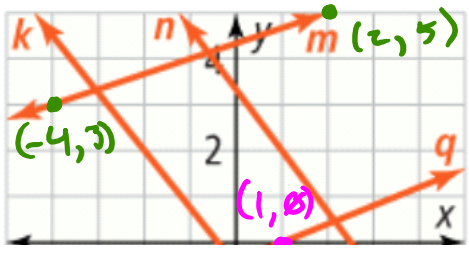
2. Are lines m and q parallel?



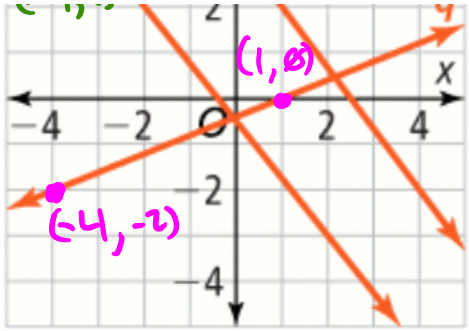
m (-4, 3) (2, 5)

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

$\frac{1}{6}$ $\frac{1}{3}$

$q(-4,-2)$ $(1,0)$

$\frac{2}{5}$



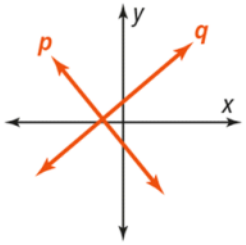
Not //

Two non-vertical lines are perpendicular if and only if the product of their slopes is −1.

A vertical line and a horizontal line are perpendicular to each other.

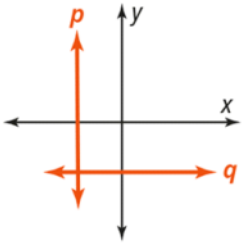
PROOF: SEE LESSON 7-4.

If... p and q are both not vertical



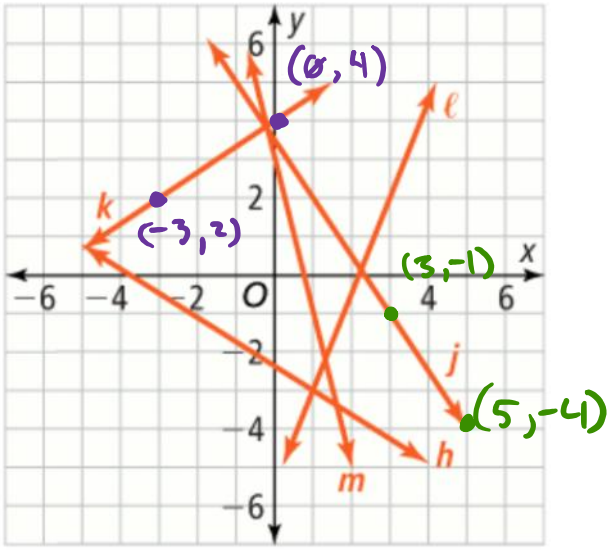
Then... $p \perp q$ if and only if the product of their slopes is −1

If... one of p and q is vertical and the other is horizontal



Then... $p \perp q$

Are lines *j* and *k* perpendicular?



j (3, -1) (5, -4)

$\frac{-3}{2}$

K (-3, 2) (0, 4)

$\frac{2}{3}$

yes, ⊥

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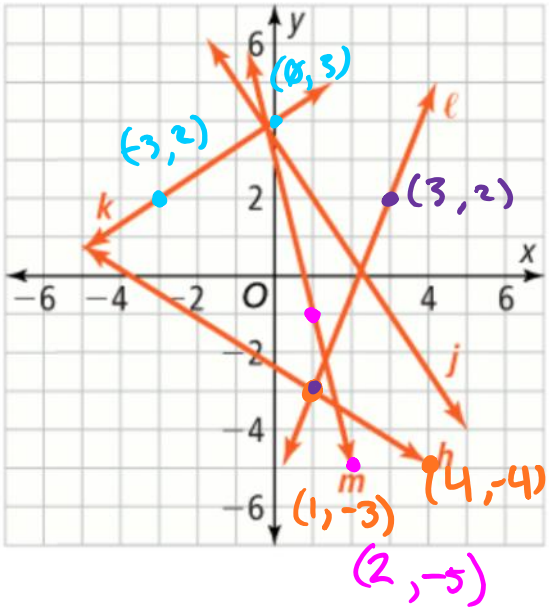
3. a. Are lines *h* and *ℓ* perpendicular?

b. Are lines *k* and *m* perpendicular?



h (1, -3) (4, -4)

$\frac{-1}{3}$

ℓ (1, -3) (3, 2)

$\frac{5}{2}$ Not ⊥

K (-3, 2) (0, 3)

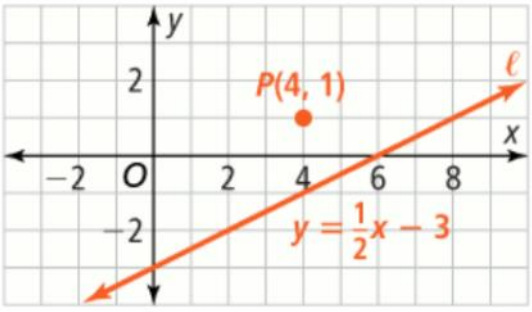
$\frac{1}{3}$

m (1, -1) (2, -5)

$\frac{-4}{1}$ -4 not ⊥

Write Equations of Parallel and Perpendicular Lines

A. What is an equation of the line through *P* that is parallel to *ℓ*?



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

$1 = 2 + b$

$-1 = b$

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

B. What is the equation of the line through *P* that is perpendicular to *ℓ*?

⊥

$1 = -2(4) + b$

$1 = -8 + b$

$9 = b$

$y = -2x + 9$

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4. What are equations of lines parallel and perpendicular to the given line *k* passing through point *T*?

a. $y = -3x + 2;\ T(3,\ 1)$

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$1 = -3(3) + b$

$1 = -9 + b$

$10 = b$

$y = -3x + 10$

⊥

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

$1 = 1 + b$

$0 = b$

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

b. $y = \frac{3}{4}x - 5;\ T(12, -2)$

//

$-2 = \frac{3}{4}(12) + b$

$-2 = 9 + b$

$-11 = b$

$y = \frac{3}{4}x - 11$

⊥

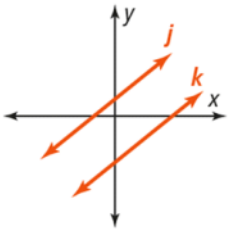
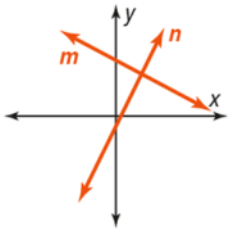
$-2 = -\frac{4}{3}(12) + b$

$-2 = -16 + b$

$14 = b$

$y = -\frac{4}{3}x + 14$

Slopes of Parallel and Perpendicular Lines

	Parallel Lines	Perpendicular Lines
DIAGRAMS		
SYMBOLS	$j \parallel k$ if and only if the slopes are the same.	$m \perp n$ if and only if the product of the two slopes is -1.

Homework

Pg. 97
13, 15, 26, 27, 29, 31, 32