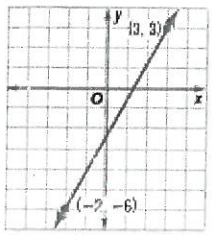
NAME _____ DATE _____ PERIOD _____

Lesson 3.3 Notes Slope of a Line

Example 1: Find the slope of each line.

a. Positive Slope

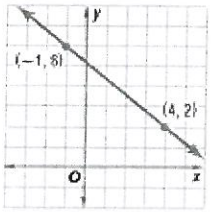


Substitute $(x_1, y_1) = (3, 3)$ and $(x_2, y_2) = (-2, -6)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6 - 3}{-2 - 3} = \frac{-9}{-5} = \frac{9}{5}$$

If the line is facing in positive x-direction, then it has positive slope.

b. Negative Slope

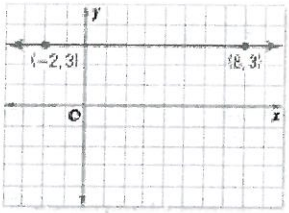


Substitute $(x_1, y_1) = (-1, 6)$ and $(x_2, y_2) = (4, 2)$

$$m = \frac{2 - 6}{4 - (-1)} = \frac{-4}{5}$$

If the line is facing in negative x-direction, then it has negative slope.

c. Zero Slope: horizontal line

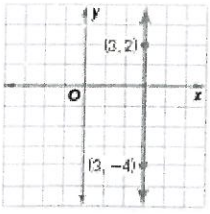


Substitute $(x_1, y_1) = (-2, 3)$ and $(x_2, y_2) = (8, 3)$

$$m = \frac{3 - 3}{8 - (-2)} = \frac{0}{10} = 0$$

Horizontal line has a zero slope

d. Undefined Slope: vertical line



Substitute $(x_1, y_1) = (3, 2)$ and $(x_2, y_2) = (3, -4)$

$$m = \frac{-4 - (-2)}{3 - 3} = \frac{-2}{0} = \text{undefined}$$

Vertical line has no slope = undefined slope

Example 2: Real-World Example: Use Slope as Rate of Change

SALES Between 1990 and 2000, annual sales of a sports equipment store increased by an average rate of \$67.5 million per year. In 2000, the total sales were \$1003.2 million. If sales increased at the same rate, what will the total sales be in 2005?

Understand Use the data given to solve for the point (x_2, y_2). Let $(x_1, y_1) = (2000, 1003.2)$, $m = 67.5$, and $x_2 = 2005$.

$m = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow 67.5 = \frac{y_2 - 1003.2}{2005 - 2000}$

$\frac{67.5}{1} = \frac{y_2 - 1003.2}{5}$

$337.5 = y_2 - 1003.2$

$1340.7 = y_2$

The coordinates of the point representing the sales for 2005 are (2005, 1340.7).
Thus, the total sales in 2005 will be about \$1340.7 million.

Example 3: Determine Line Relationships

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

Determine whether $\overline{XY}$ and $\overline{WZ}$ are *parallel*, *perpendicular*, or *neither* for $X(9, 5)$, $Y(-1, 6)$, $W(-8, 2)$, $Z(12, 4)$. Graph each line to verify your answer.

Step 1 Find the slope of each line.

$m_{XY} = \frac{6-5}{-1-9} = \frac{1}{-10}$

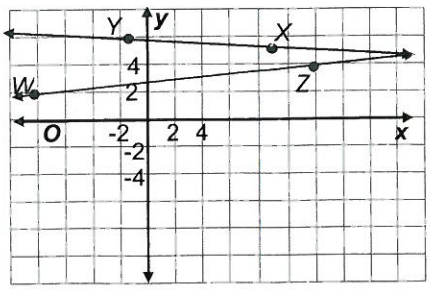
$m_{WZ} = \frac{4-2}{12-(-8)} = \frac{2}{10} = \frac{1}{10}$

* If two lines are parallel, they have the same slope
* If two lines are perpendicular, their slopes ($m_1 \cdot m_2 = -1$) are reciprocal of each other.

Step 2 Determine the relationship, if any, between the lines.

So, the slope of $\overleftrightarrow{XY}$ and $\overleftrightarrow{WZ}$ are not same. Then, they are not parallel. The product of the slopes is $(-\frac{1}{10})(\frac{1}{10}) = -\frac{1}{100}$, so, $\overleftrightarrow{XY}$ and $\overleftrightarrow{WZ}$ are not perpendicular

CHECK: When graphed, the two lines appear to be neither parallel nor perpendicular but intersecting lines.



Example 4: Use Slope to Graph a Line

Graph the line that contains $Q(-3, 2)$ and is perpendicular to $\overline{TR}$ with $T(-1, -2)$ and $R(2, 7)$.

First find the slope of $\overline{TR}$.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{7-(-2)}{+2-(-1)}$$

$$m = \frac{9}{3} = 3$$

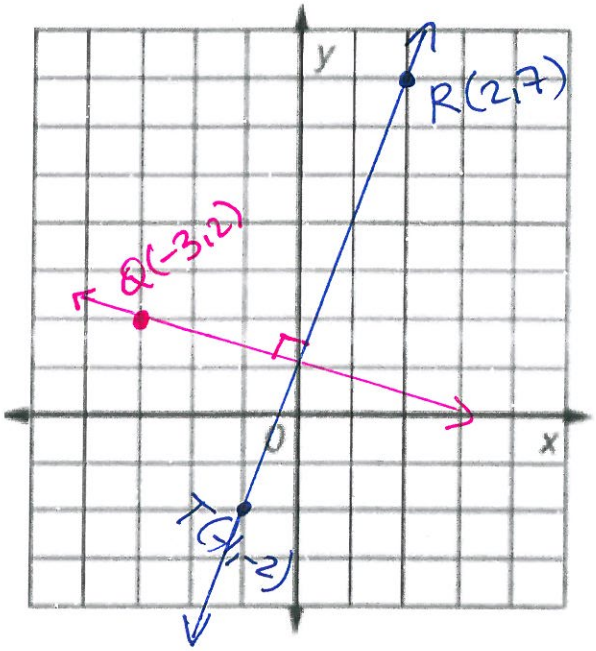
Slope of perpendicular lines

$m_1 \times m_2 = -1$

The product of the slopes of two perpendicular lines is -1

The slope of the line perpendicular to $\overline{TR}$ which is passing through $Q(-3, 2)$ is $3 \cdot (-\frac{1}{3}) = -1$, $-\frac{1}{3}$

Graph the line. Start at (-3, 2). Move down 1unit and then move right 3 units. Label point P and draw $\overline{QP}$.



COPY DOWN ALL SOLUTIONS / NOTES FROM THE BOARD! NO WORK = 0 GRADE!!!
IF YOU LOOSE IT = 0 GRADE!!!

3-3 Slope of a Line Homework Due 10/15

(Show work on an additional paper and attach at the back)

Determine the slope of the line that contains the given points.

1. $S(-1, 2)$, $W(0, 4)$

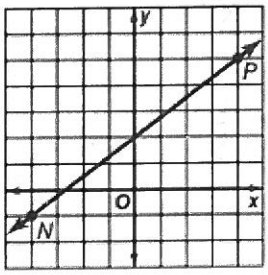
2. $G(-2, 5)$, $H(1, -7)$

3. $C(0, 1)$, $D(3, 3)$

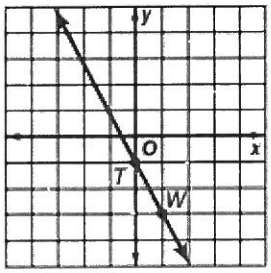
4. $J(-5, -2)$, $K(5, -4)$

Find the slope of each line.

5.



6.



Determine whether $\overleftrightarrow{AB}$ and $\overleftrightarrow{MN}$ are *parallel, perpendicular,* or *neither.* Graph each line to verify your answer.

7. $A(0, 3)$, $B(5, -7)$, $M(-6, 7)$, $N(-2, -1)$

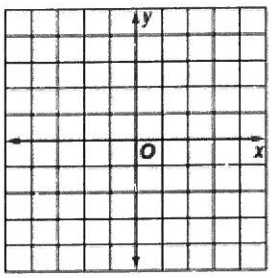
8. $A(-1, 4)$, $B(2, -5)$, $M(-3, 2)$, $N(3, 0)$

9. $A(-2, -7)$, $B(4, 2)$, $M(-2, 0)$, $N(2, 6)$

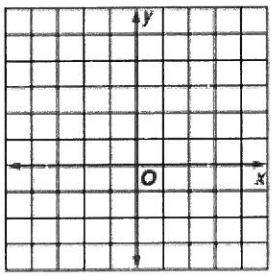
10. $A(-4, -8)$, $B(4, -6)$, $M(-3, 5)$, $N(-1, -3)$

Graph the line that satisfies each condition.

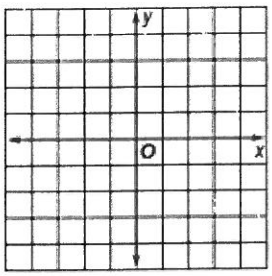
11. slope = 3, passes through $A(0, 1)$



12. slope = $-\frac{3}{2}$, passes through $R(-4, 5)$



13. passes through $Y(3, 0)$, parallel to $\overleftrightarrow{DJ}$ with $D(-3, 1)$ and $J(3, 3)$



14. passes through $T(0, -2)$, perpendicular to $\overleftrightarrow{CX}$ with $C(0, 3)$ and $X(2, -1)$