The Meaning of Slope
A carpenter is given a set of house plans that call for a 5:12 roof (or a roof with a pitch of 5:12). This means that the roof must be constructed so that for every 5 inches of rise (vertical distance), there are 12 inches of run (horizontal distance). That is the ratio of rise to run is $\frac{5}{12}$.

Slope Formula
Slope $(m)=\frac{\text { vertical change }(\text { rise })}{\text { horizontal change }(\text { run })}=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}$ where $x_{2}-x_{1} \neq 0$

The slope of a line tells us
1)
2)

## Positive slope -

Slope is positive if the line goes $\qquad$

- 2 positive directions or
- 2 negative directions

Negative slope -
Slope is negative if the line goes $\qquad$

- One positive direction and one negative direction


Example: Find the slope of the line through each pair of points.
a) points $(3,2)$ and $(-9,6)$
b) points ( $-2,-2$ ) and ( $-4,2$ )

Example: Find the slope of the line.


Graph a line with pt $(3,-1)$ and slope $\frac{1}{3}$



Graph a line with pt



## Finding Intercepts

$y$-intercept - where the line crosses the $\qquad$ and $x=$ $\qquad$
$x$-intercept - where the line crosses the $\qquad$ and $y=$ $\qquad$

Example: Find the $x$ and $y$ intercepts of the following.
a) $-2 x+4 y=16$
b) $5 x-y=10$

$$
\begin{aligned}
& x \operatorname{int}(, \quad) \\
& y \operatorname{int}(, ~)
\end{aligned}
$$

$x \operatorname{int}($,
$y \operatorname{int}($,

Example: Solve the following equations for $y$.
a) $9 x-3 y=15$
b) $-8 x+2 y=-20$

We refer to equations with $x$ and/or $y$ to the first degree as linear equations.

- $y=m x+b$ (slope intercept form)
- $A x+B y=C$ (standard form)
- $y-y_{1}=m\left(x-x_{1}\right)$ (point-slope form)

Examples of non-linear equations:
$y=x^{2}$
$y=x^{3}$
$y=|x|$

$$
y=\sqrt{x}
$$

## Slope-Intercept Form

$$
y=m x+b
$$

Where $m$ is the slope of the line and $b$ is the $y$-intercept.

* The easiest way to graph a line in slope-intercept form is to first graph the
$\qquad$ then use the $\qquad$ to find two other points on the line.
a) Graph $y=\frac{3}{4} x+2$.
b) Graph $y=-\frac{1}{3} x-2$
$m=$
$b=$
$m=$
$b=$

a) Find the equation of a line with a slope of -4 and a point $(0,9)$

b) Find the equation of a line with the slope of $\frac{2}{3}$ and passing through ( $0,-4$ ).

* One way to graph a line in standard form is to find the $\qquad$ \& $\qquad$ .
a) Graph $-2 x+4 y=-8$

$$
x-\operatorname{int}(,)
$$

b) Graph $5 x-6 y=30$

$$
x \text {-int ( , ) }
$$

$$
y-\operatorname{int}(, ~)
$$

$$
y-\operatorname{int}(,)
$$



*When the $x$ and $y$ intercept are the point $(0,0)$ then choose any other $x$ value as an independent variable, calculate $y$, and plot the $2 n d$ point.
c) Graph $-6 x+2 y=0$
d) Graph $5 x-4 y=10$



* You can also graph an equation in standard form by transforming it into
a) Graph $-10 x+2 y=-6$
b) Graph $-6 x+3 y=12$



* The easiest way to graph a line in point-slope form is to first graph the
$\qquad$ then use the $\qquad$ to find two other points.
a) Graph $y-2=-3(x+4)$

$$
\begin{aligned}
& \text { pt (, ) } \\
& m=
\end{aligned}
$$

b) Graph $y+3=\frac{1}{4}(x-2)$



## Writing Equations of Lines

a) Write an equation in point-slope form of the line through point $(2,-4)$ with slope -1 .
c) Write an equation in slopeintercept form that contains the points $(5,0)$ and $(7,-3)$

$m=$
a) Write the equations for the horizontal and vertical lines that contain the point $(5,-1)$.
horizontal
vertical
b) Write an equation in point-slope form of the line with slope -8 through point $(3,-6)$
d) Write an equation in slopeintercept form that contains the points $(4,-9)$ and $(-1,1)$

Vertical Line

$m=$
b) Write the equations for the horizontal and vertical lines that contain the point $(-7,-5)$.
horizontal
vertical

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