## Writing Equations of Lines

The equation of a line can be found if you know the slope of the line and a point on the line. To find the equation, you will use the point-slope formula.

$$
y-y_{1}=m\left(x-x_{1}\right)
$$

where $m=$ slope of the line and $\left(x_{1}, y_{1}\right)$ is the point on the line

Example: Given a point and the slope

1. Find the equation of the line with a slope of 3 that passes through $(-1,5)$.

Start with the formula: $\quad y-y_{1}=m\left(x-x_{1}\right)$
Plug in the values: $\quad y-(5)=3(x-(-1))$
Adjust any signs: $\quad y-5=3(x+1)$
Distribute the 3: $\quad y-5=3 x+3$
Add 5 to both sides $\quad y=3 x+8$
(to solve for y )
Answer: $\quad y=3 x+8$
2. Find the equation of the line with a slope of 4 that passes through $(3,-2)$.

First, calculate the slope of the line by using the slope formula.
The points are $\left(\mathrm{x}_{1}, \mathrm{y}_{1}\right)$ and $\left(\mathrm{x}_{2}, \mathrm{y}_{2}\right) \quad m=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}$

Then, choose one of the given points and the slope to use the point-slope formula.
3. Find the equation of the line that passes through $(-2,5)$ and $(1,2)$

Calculate the slope using the formula:

$$
m=\frac{y_{2}-y_{1}}{x_{2}-x_{1}}=\frac{2-5}{1-(-2)}=\frac{-3}{3}=-1
$$

Now, use that slope and one of the points in the point-slope formula.
$m=-1$, and $(-2,5)$

Substitute values
Adjust the signs
Distribute
Add 5 to both sides

$$
y-y_{1}=m\left(x-x_{1}\right)
$$

$$
y-5=-1(x-(-2))
$$

$$
y-5=-1(x+2)
$$

$$
y-5=-x-2
$$

$$
y=-x+3
$$

4. Find the equation of the line that passes through $(-1,4)$ and $(-2,6)$
