

Summary of Lines: Sections 3.1 to 3.5

Forms of a Line Equation:

<p>Standard Form: $Ax + By = C$ A, B, C are real number constants</p> <p>Example: $2x + 3y = 6$</p> <p>(Tip: this is the easiest form to find the x and the y intercepts)</p>	<p>Slope-Intercept Form: $y = mx + b$ m = slope b = y-intercept</p> <p>Example: $y = -2x + 1$</p> <p>so $m = -2$ and $b = y_{int} = 1$</p> <p>(Tip: this form makes it very easy to create a t-chart for graphing. Also, you can graph by plotting the y-intercept and using the slope to locate a second point.)</p>	<p>Point-Slope Form: $y - y_1 = m(x - x_1)$ m = slope (x_1, y_1) = a point on the line</p> <p>This form of a line equation is used to "Find the equation of a line..." given some information about the line.</p> <p>Example: Find the equation of the line passing through $(-1, 2)$ and having a slope of 3.</p> <p>Equation: $y - 2 = 3(x - (-1))$</p>
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Graphing lines:

<p>Make a t-chart (table of values) by picking some x-values, plugging each x-value into the equation, and finding the corresponding y-value.</p> <p>Example: Graph $y = -2x + 1$ by forming a t-chart with 5 values in it:</p> <div style="display: flex; align-items: center;"> <table border="1" style="margin-right: 10px;"> <tr><th>x</th><th>y</th></tr> <tr><td>-2</td><td>5</td></tr> <tr><td>-1</td><td>3</td></tr> <tr><td>0</td><td>1</td></tr> <tr><td>1</td><td>-1</td></tr> <tr><td>2</td><td>-3</td></tr> </table> <div style="margin-left: 10px;"> <p>$-2(-2) + 1 = 5$ etc.</p> </div> </div>	x	y	-2	5	-1	3	0	1	1	-1	2	-3	<p>Find the x-intercept and y-intercept by setting up "the checkerboard". Find additional points in the usual t-chart way.</p> <p>Example: Graph $2x + 3y = 6$ by finding the intercepts and also one checkpoint.</p> <div style="display: flex; align-items: center;"> <table border="1" style="margin-right: 10px;"> <tr><th>x</th><th>y</th></tr> <tr><td>0</td><td>2</td></tr> <tr><td>3</td><td>0</td></tr> <tr><td>1</td><td>$\frac{4}{3}$</td></tr> </table> <div style="margin-left: 10px;"> <p>checkerboard</p> <p>filled in</p> <p>checkpoint</p> </div> </div>	x	y	0	2	3	0	1	$\frac{4}{3}$	<p>Use the y-intercept and the slope to graph the line.</p> <p>Example: $y = -2x + 1$</p> <p>Plot the y-intercept: $(0, 1)$</p> <p>Use $m = \frac{\text{rise}}{\text{run}} = \frac{-2}{1}$ to move FROM THE Y-INT to another point on the line.</p>
x	y																					
-2	5																					
-1	3																					
0	1																					
1	-1																					
2	-3																					
x	y																					
0	2																					
3	0																					
1	$\frac{4}{3}$																					

Finding the Slope of a line:

<p>From a graph you can use $m = \frac{\text{rise}}{\text{run}}$, going from one point to the another on the line.</p> <p>Example: $m = \frac{-3}{1} = -3$</p>	<p>If you know two points $(x_1, y_1), (x_2, y_2)$ that lie on the line, use the slope formula</p> $m = \frac{y_2 - y_1}{x_2 - x_1}$ <p>Example: Find the slope of the line passing through $(1, -2)$ and $(-3, -4)$</p> $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-4) - (-2)}{(-3) - (1)} = \frac{-2}{-4} = \frac{1}{2}$ <p>so $m = \frac{1}{2}$</p>	<p>If you have a line equation, solve it for y to put it into slope-intercept form $y = mx + b$.</p> <p>Example: Find the slope of the line given by the equation $2x + 3y = 6$</p> $2x + 3y = 6$ $3y = -2x + 6$ $\frac{3y}{3} = \frac{-2x + 6}{3}$ $y = -\frac{2}{3}x + 2$ <p>so the slope of the line is $m = -\frac{2}{3}$</p>
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Miscellaneous Line Facts:

Parallel lines have the **SAME SLOPE**

Example: $y = 3x + 1$ and $y = 3x - 4$ are parallel.

Each line has a slope of 3.

Perpendicular lines have slopes which are **OPPOSITE IN SIGN** and **RECIPROCAL**s of each other. (Flip AND change the sign.)

Example: $y = 3x + 1$ and $y = -\frac{1}{3}x + 2$ are perpendicular.

The first line has a slope of 3.

The second line has a slope of $-\frac{1}{3}$

Horizontal Lines:

Equation of a horizontal line: $y = \text{constant}$

Example: $y = 2$

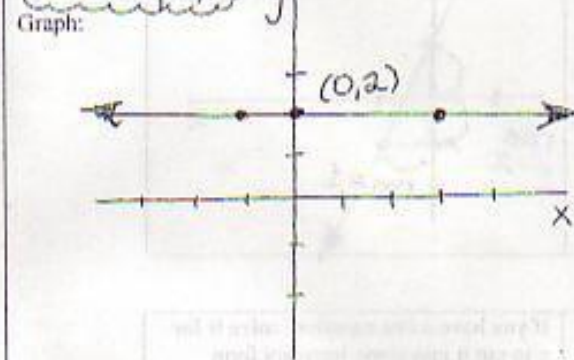
T-chart: y is stuck on 2. Fill in any x -values you please. **Be sure to include $x = 0$ to get the intercept.**

x	y
2	2
2	2
2	2

⇒

x	y
-1	2
0	2
3	2

fill in with any values for x



Slope: Slope is ZERO ($m = 0$).

It is zero due to zero in the numerator (the rise is always zero for a horizontal line).

Vertical Lines:

Equation of a vertical line: $x = \text{constant}$

Example: $x = 3$

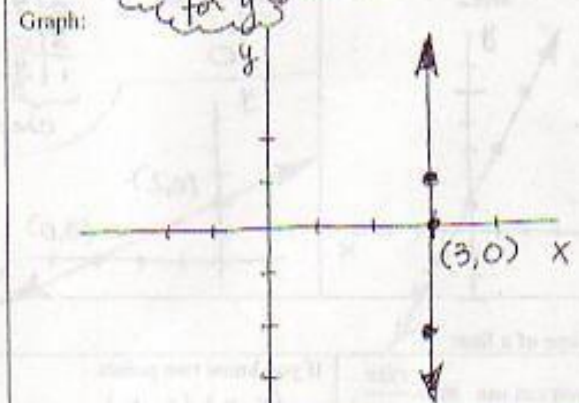
T-chart: x is stuck on 3. Fill in any y -values you please. **Be sure to include $y = 0$ to get the intercept.**

x	y
3	
3	
3	

⇒

x	y
3	-2
3	0
3	1

fill in any values for y



Slope: Slope is UNDEFINED (don't call it "No Slope"!!!)

It is undefined due to division by zero (the run is always zero for a vertical line).