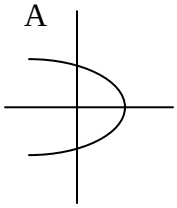
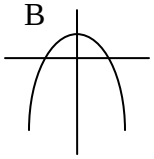
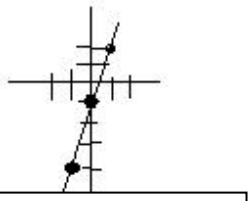
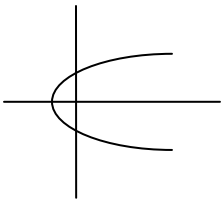
M^2=Math Mediator Lesson 9: Linear Functions

Total Recall (Warm-up) (5 minutes approx.)	Total Recall: Exercise from yesterday's lesson on area and Equations. 1. Which of these, if any, is a function: A: B is a function, A is not. A  B  2. Is this set of ordered pairs a function? (0,3); (2,-1); (-1,2); (4,4) A: Yes
Activity (15 minutes approx.)	1. Assign students to small groups to work on Linear Functions. Most have cellular phones that have various calling plans. Some may have unlimited calling or texting. Others have limited minutes with extra fees for going over those minutes. 2. Given a plan of 300 minutes a month for $35.00 and $0.40 per extra minute, develop an equation that expresses the possible monthly charges. Consider various scenarios, one staying within 300 minutes, another going over by one hour. Give students a couple minutes to think about this, then recommend to use two variables. Let 'x' equal minutes over 300 and let 'y' equal total charges for the month. 3. After they all get the equation: $y = 0.4x + 35$; have them plot charges for the following minutes: a) 250 minutes; b) 310 minutes; c) 400 minutes. Make sure that the x-y axis are labeled with even scale divisions in order to produce a line from these three points. This is a linear plot, a linear function with two variables. 4. Have one group or a couple groups make a presentation to the rest of the class, either on small white boards or on larger board.
Direct Instruction (5 minutes approx.)	Definitions: $y = mx + b$ is a linear equation; the form is slope-intercept $f(x) = mx + b$ is a linear function. It is written with function notation f(x), and is stated as "the value of this function 'f' at x" or "f of x". Other letters can be used for functions: $g(x) = mx + b$; or $h(x) = 3x - 2$. In these equations, 'x' is the independent variable. This means that it is not dependent on anything, except that it belongs to a certain number set (all real numbers is typically implied). The 'x' variable can also be said to be the input or 'domain' value. The f(x) or y value is the dependent variable, because it is dependent on the x variable. The 'y' value can also be said to be the 'range' value.
Direct Instruction (5 minutes approx.)	One method to plot two variable equations is to build a table of values. Put the two variables at the top of the table columns. Pick some 'x' values that give easy 'y' solutions. Typically 1, 0, and -1 are good choices. Then substitute these 'easy' picked values into the equation and solve for y. Do enough of these to

<table>
<tr><td></td><td colspan="2">establish a pattern, by plotting the results.</td></tr>
<tr><td>Practice and assessment: (5 minutes approx.)</td><td>Example: f(x) = 3x -1

<u>x</u> <u>y</u>
1 2
0 -1
-1 -4

U-DO: f(x) = 2x + 2 Is it a function?</td><td> 
Plot of y = 3x - 1</td></tr>
<tr><td>Exercise: (5 minutes approx.)</td><td colspan="2">U-DO: x = y² -2 Look at the problem and think about the easiest way to solve it. Previously, we picked some easy numbers for x and built a table solving for y. In this case, there may be an easier way to build a table of values. Pick some easy y values and solve for x.

 
Plot of x = y² - 2
Is this a function?
Does it pass the vertical line test?
Is this linear?</td></tr>
<tr><td>Exercise: (10 minutes approx.)</td><td colspan="2">U-DO: Plot #1 and #2 and decide if either is a function.
1. f(x) = 2x + 1 (Compare with earlier exercise; y intercept) A: Yes, function.
2. f(x) = x² + 2 A: Yes, function.
3. If g(x) = x³ – 3; then what is g(-2) A: -11</td></tr>
<tr><td>Wrap-up (5 minutes approx.)</td><td colspan="2">Wrap up closing comments and housekeeping.</td></tr>
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