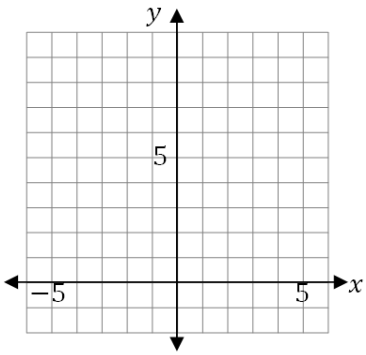
Exploring Piecewise Functions

Sometimes a simple function is sufficient for an application, but often the type of function needed changes over a given domain. This is when we need a *piecewise function* to allow us to "glue" several functions together to make one function. Let's see how this works.

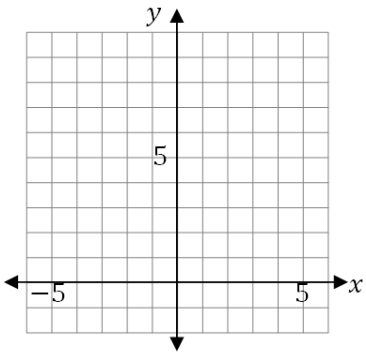
Cutting Graphs

1. Begin by graphing the following functions on three separate graphs.

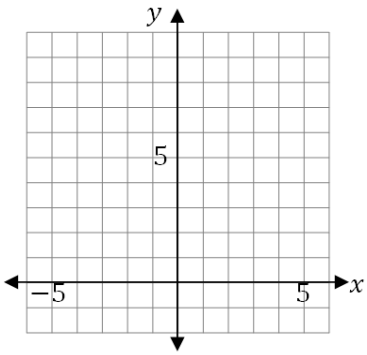
A) $y = -x$



B) $y = 2$



C) $y = \frac{1}{2}x^2$



2. Now cut out each square graphing grid.
3. Cut each grid on the given vertical lines and discard the portion described.
   a. Cut graph (A) on the vertical line $y = -2$. Keep the left section and discard the right section. Draw a closed dot on the right end of this graph.
   b. Cut graph (B) on the vertical lines $y = -2$ and $y = 1$. Keep the middle section and discard the left and right sections. Draw an open dot on the far left side of the graph and a closed dot on the far right side of the graph.
   c. Cut graph (C) on the vertical line $y = 1$. Keep the right section and discard the left section. Draw an open dot on the far left of this graph.
4. Now tape the remaining three pieces together to make one graph lining up the x-axis to show the entire domain $-6 < x < 6$.

You have now "pieced together" the graph of the piecewise function

$$y = \begin{cases} -x, & if\ x \le -2 \\ 2, & if\ -2 < x \le 1 \\ \frac{1}{2}x^2, & if\ x > 1 \end{cases}$$

The key to graphing a piecewise function is to "cut" the graphs by vertical lines to end up with the correct graph made of these vertical slices.