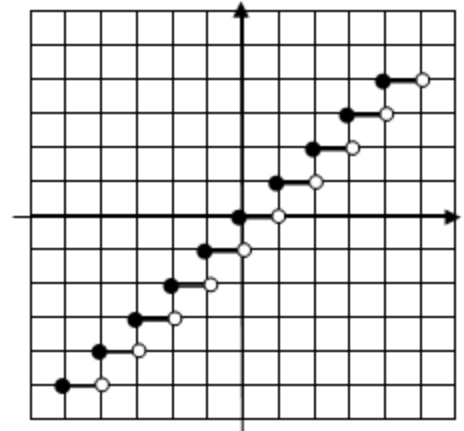


Investigating Step Functions

Name _____

Part 1: Don't Give Me Fractions...

If you ask someone their age, they seldom tell the truth. Although you might have been alive for 14 years, 6 months, 9 hours and 34 minutes, you'll probably say you're 14 years old. You are using the **greatest integer function** or $f(x) = [x]$. Its technical definition is "the greatest integer less than or equal to x ", but most people think of it as the "floor function" or "round down function", because that's what happens to x .

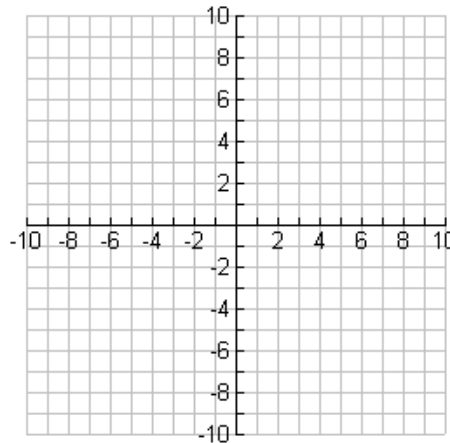


What is $[6]$? _____ $[5.9] =$ _____ $[-3.4] =$ _____

Its graph appears to be a series of stair steps. Why is this so?

Part 2: Let's graph another step function ...

$$\text{Graph } f(x) = \begin{cases} 5 & x \geq 5 \\ 3 & 2 < x < 5 \\ 1 & x \leq 2 \end{cases}$$



Domain: _____

Range: _____

Points of Discontinuity: _____

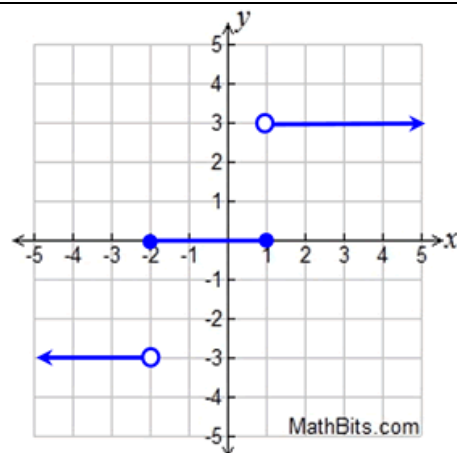
Intervals Constant: _____

Intervals of increasing: _____

Part 3: Write the piecewise function ...

Write the step function as a piecewise function.

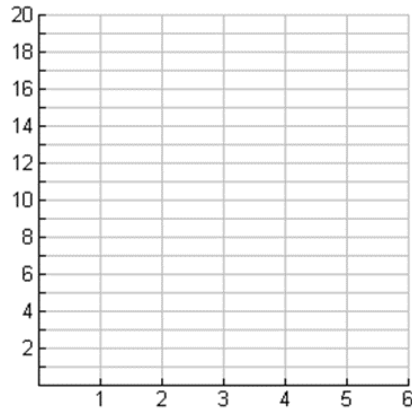
$$f(x) = \left\{ \begin{array}{l} \\ \\ \\ \end{array} \right.$$



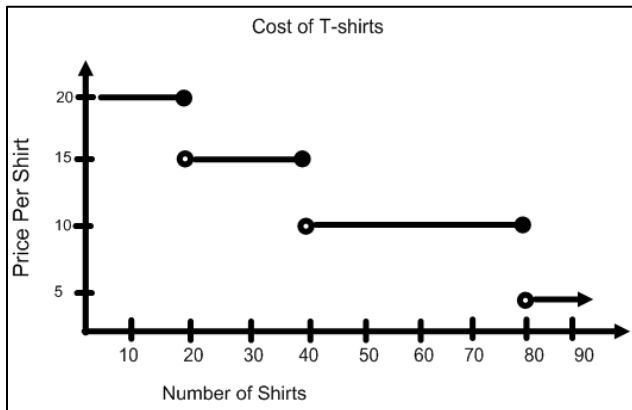
Part 4: Applications ...

You get paid to pick up recycling materials along the side of the road every day. You are given a bag each day to collect plastic bottles and aluminum cans in. If you collect 3 pounds or less than 3 pounds, you earn \$8. If you collect between 3 and 5 pounds, you get \$12 and if you collect 5 pounds or more than 5 pounds, you get \$16. Write a piecewise function and a graph that models your income.

$$f(x) = \left\{ \right.$$

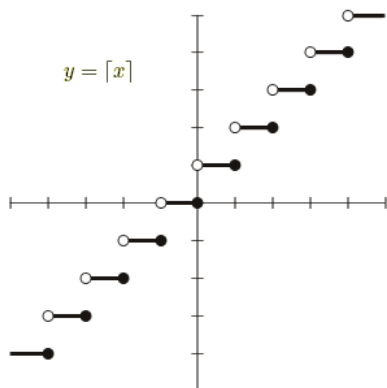


The following application rounds up instead of down. In this example, the cost of t-shirts decreases per shirt as the number of shirts ordered increases.



- a. If your club orders 40 t-shirts, what is the cost per shirt?
- b. If your club orders 41 t-shirts, what is the cost per shirt?
- c. Write the step function as a piecewise function.

$$f(x) = \left\{ \right.$$



Part 5: Least integer function ...

This is a graph of the **least integer function** or $f(x) = \lceil x \rceil$. Its technical definition is “the least integer greater than or equal to x ”, but most people think of it as the “ceiling function” or “round up function”, because that’s what happens to x .

The t-shirt example above followed this notion. Can you think of other places in real life that follow either a greatest integer or a least integer model?