

Math 100 lab problems, Jan. 29, 2019

(Be sure to turn in your solutions as part of the homework due next Tuesday, Feb. 4.)

1. Let $f(x) = \frac{x}{x}$.
 - a. What are the domain and range of f ? (Use interval or set-builder notation.)
 - b. Draw the graph of f .
2. Use algebra to find the domain of $f(x) = \sqrt{2x^3 - 50x}$. Write your answer with interval notation.
3. Use a graphing calculator or program like Desmos to graph $g(x) = 2x^3 - 50x$. Use the picture to find the domain of $f(x) = \sqrt{g(x)}$. Write your answer with interval notation.
4. Graph the following piecewise function:

$$f(x) = \begin{cases} x + 1 & \text{if } x < -1 \\ -2x & \text{if } -1 \leq x \leq 1 \\ x - 1 & \text{if } x > 1 \end{cases}$$

5. What are the domain and range of the piecewise function f from the previous question? What is wrong with trying to define a function g to be exactly the same as f except for writing “if $x \geq 1$ ” for the last case?
6. Graph the following piecewise function:

$$f(x) = \begin{cases} 0 & \text{if } x < 0 \\ \sqrt{x} & \text{if } -x \geq 0 \end{cases}$$

What are the domain and range of f ?

7. Find the average rate of change of $y = x^2 + 1$ over the intervals $[-1, 0]$, $[-1/2, 1/2]$, and $[0, 1]$.
8. The graph of the linear function $y = mx + b$ is a line. Show that the average rate of change is the same on every interval.
9. True or false: If the average rate of change of a function is always the same over every interval, then the function is linear (i.e., the graph is a line). Sketch some pictures and explain your thinking.
10. Find the average rate of change of $f(x) = 3x^2 - 2$ on $[x, x + h]$.
11. Draw the graph of f from the previous problem. Let $x = 2$ and consider in turn the following values of h : 10, 1, and .1. Draw the graphs of the secant lines (on the same graph) for these choices of x and h . What do you notice?