

Section 1.1

Section Objectives:

- Know the definition of a function. Know what the domain and range (or codomain) of a function are. Know what the independent and dependent variables are.
- Recognize functions from diagrams, tables, graphs and algebraic expressions.
- Determine the domain of a function from a graph and algebraic expression.
- Understand $f(x)$ function notation.
- Work with piecewise functions.
- Be comfortable graphing basic functions with and without a calculator. (including x^2 , x^3 , \sqrt{x} , $\sqrt[3]{x}$ and $|x|$).
- Know what it means for a function to be continuous, increasing, decreasing, concave up and concave down.

Practice Problems

1. Draw a diagram (“potato diagram”, see figure 1.4 in text) for a function whose domain is $\{1, 2, 3\}$ and whose range (or codomain) is $\{4, 5\}$ or explain why this is impossible.
2. UConn wants to know if students with certain first names are more likely to have more siblings. They make a table with a student’s first name in one column and the number of siblings in the second column. Does this table represent a function? Why or why not?
3. Draw a graph of $f(x) = \sqrt{x-1}$ and find the domain of this function algebraically.
4. Let $f(x) = \frac{3x^2}{x+1}$. Find $f(x) + f(2)$ and $f(x+2)$.

5. Let $f(x) = \begin{cases} x^2 & -1 < x < 4 \\ 2x - 1 & x \geq 4 \end{cases}$. Graph $f(x)$ and find its domain. Is this function continuous on its domain?

6. Draw a graph of a single continuous function on the domain from -10 to 10 that satisfies ALL the following conditions: is increasing from -1 to 5 and otherwise decreasing, is concave up when $x < 0$ and otherwise concave down.

7. The new 2018 tax rules have a \$12,000 standard deduction (meaning that you do not have to pay taxes on your first \$12,000 dollars of income.) After this, \$0-\$9525 are taxed at 10% and \$9525-\$38,700 are taxed at 12%. Express the amount of tax you owe for income up to \$50,700 as a piecewise function. Is this function continuous? Is it increasing? What do your answers to the last two questions mean in terms of tax implications? (Note: this assumes you are taking the standard deduction and have no other ways to decrease your taxable income, it is very simplified)

More Practice from Textbook 1.1: You should do as many problems from each set (1-6, 7, 8, 9-10, 11-24, 25-31, 32-38, 39-42, 43-50, 51-58, 59-66, 67-88), as needed until you are comfortable with these techniques. 67-88 are good practice for more complicated application problems.