LECTURE NOTES: 1-1 FOUR WAYS TO REPRESENT A FUNCTION

Functions can be represented in a variety of ways. Specifically, there are four that we will focus on during this course. They are:

Example 1: (Graphically) Interpreting the graph of a function. The graph of a function f is shown below. Find the following:

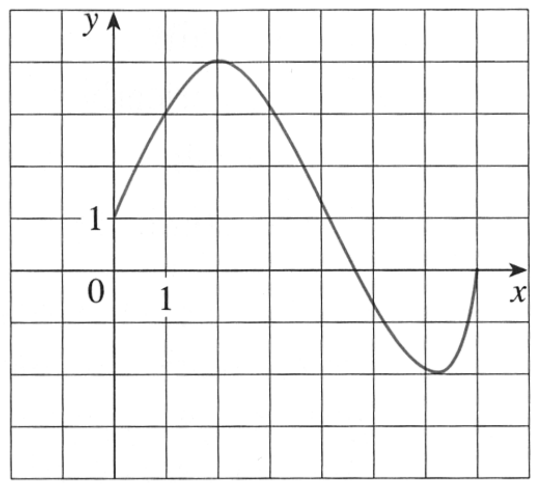
a) $f(1)$ and $f(5)$

b) the domain of f

c) the range of f

d) For which value of x is $f(x) = 4$?

e) Where if f increasing?



Example 2: (Algebraically) If $f(x) = 3x^2 - x + 2$ find the following. Are (b) and (c) different?

(a) $f(2)$

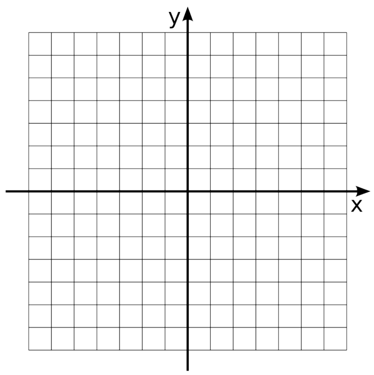
(d) $\dfrac{f(a+h) - f(a)}{h}$

(b) $f(a^2)$

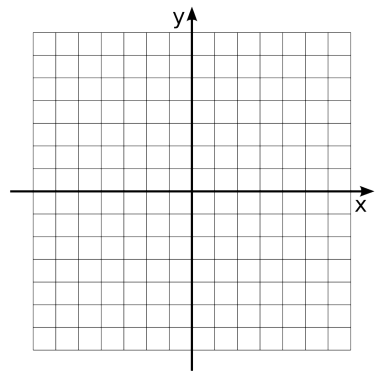
(c) $[f(a)]^2$

Example 3: Graph the following functions. Give the domain and range.

a) $f(x) = \begin{cases} -1 & \text{if } x \geq 2 \\ 7 - 2x & \text{if } x < 2 \end{cases}$



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



Domain of a Function:

The **domain** of a function is the set of all possible values of the input. One can find the domain of a function from a picture, but it is also possible to do so from an equation. In many instances it is easier to think about what operations are illegal and leave out the numbers that break these operations. Remember,

1. Thou shalt not divide by ____________. Set the __________________ equal to zero. Leave these numbers out.
2. Thou shalt not square root ____________. Set the stuff under the radical ___ zero and solve. Note, solving polynomial inqualities is not simple.
3. Thou shalt not take the logaraithm of ____________. Set the stuff inside the logarithm ___ zero and solve. This process is quite similar to # 2.

Example 3: Find the domain of each function. Give the domain using interval notation.

(a) $f(x) = \dfrac{1}{x^4 - 16}$

(b) $f(x) = \sqrt{x} + \sqrt{11 - x}$

Example 4: Find the domain of each function. Give the domain using interval notation.

a) $g(x) = \ln(x^2 - 4)$

b) $h(x) = \frac{1}{\sqrt{x^2-5x-6}}$

Example 6: A rectangular storage container with an open top has a volume of 10 m^3. The length of its base is twice the width. Materials for the base cost \$10 per square meter and material for the sides cost \$6 per square meter. Express the cost of materials as a function of the width of the base. Give the domain of the function.

Symmetry

- A function $f(x)$ is called even if ____________. An example is $f(x) =$ ______. Even functions are symmetric about ____________.
- A function $f(x)$ is called odd if ____________. An example is $f(x) =$ ______. Odd functions are symmetric about the origin.

Example 7: Determine whether the following functions are even, odd, or neither.

a) $g(x) = e^x + 1$

b) $f(x) = 1 + 3x^2 - x^4$

c) $f(x) = \frac{x}{x^2+1}$