Written Homework 2

Math 111

Due January 24th at the start of class

Textbook Exercises:

Section 1: 16, 18, 20

Section 2: 2, 4, 8, 10, 12, 14, 16, 44, 46, 48, 50, 52, 54

Exercise 1: A small chamber is flooded with oxygen. It begins as a vacuum (that is, there is no gas at all). Then oxygen is pumped in at a constant rate of 1 gram per second. When there are 10 grams of oxygen in the chamber, the pump shuts off. This behavior can be modeled by the function

$$X(t) = \begin{cases} 0, & t < 0 \\ t, & 0 \le t \le 10 \\ 10, & 10 < t \end{cases},$$

where $X(t)$ gives the number of grams of oxygen in the chamber t seconds after the pump is started.

a) Evaluate $X(0)$, $X(10)$, $X(15)$, and $X(-15)$.

b) Write a sentence interpreting $X(5)$.

c) Find the domain and image of $X(t)$ and express your answers in interval notation. As in the previous exercise, it may help to sketch a graph.

d) Find the practical domain and practical image of $X(t)$. Express your answers in interval notation.

Exercise 2: Let $p(x)$ be a function that is defined on $(-\infty, \infty)$ and whose average rate of change between any two points is -3.

a) What *kind* of a function is p?

b) Suppose $p(6) = 2$. Find an equation for p.

c) What is $p(0)$?

d) Where (if anywhere) is p strictly increasing? Where is it strictly decreasing? Where is it constant? Express your answers in interval notation.