Solutions

Assignment 9

Math 1030

Due Friday, November 9th

1. **Functions**

(a) Suppose we make a table of barometric pressure readings every morning at 6:00 AM. In the left column we have the date of the reading, and in the right column we have the reading.

i. Does this represent a function? Explain why.

Yes. Each unique input (date) has a unique output (barometric pressure).

ii. If so, what is the dependent variable?

Barometric pressure

iii. What is the independent variable?

Date

(b) We are given that a function $f(x)$ is odd and has period 3. If $f(1) = 4$ what are:

i. $f(-1)$? $4 = f(1)$ $\quad f(-1) = -f(1) = \boxed{-4}$

ii. $f(4)$? $f(4) = f(1+3) = f(1) = \boxed{4}$

iii. $f(-7)$? $f(7) = f(4+3) = f(4) = 4$

$f(-7) = -f(7) = \boxed{-4}$

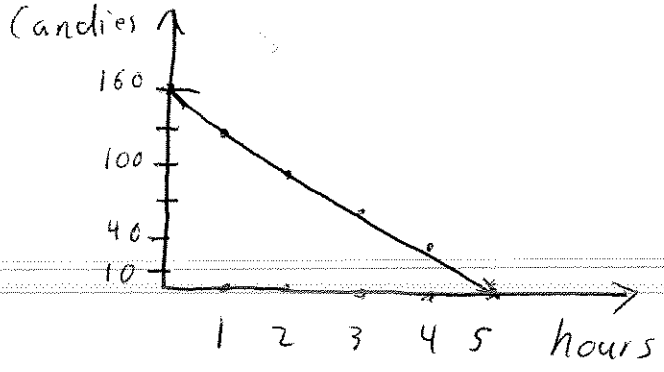
2. **Linear Modeling**

(a) Suppose you are giving out candy to trick-or-treaters and you start the night at 6:00 PM with 160 candies. Each hour you give away 30 candies, and you have trick or treaters for 5 hours.

i. Can you create a linear model for this? What would be the slope and initial value of your linear model? What would be the linear equation?

Yes. Slope is -30 candies/hour.
Initial value is 160 candies.
Equation: $C(t) = -30(t) + 160$ Time 0 = 6:00 PM, t in hours.

ii. Construct a graph of this linear model over the given time, treating time 0 as 6:00 PM.



iii. How many candies will you still have for yourself at the end of the night?

$C(5) = 160 - 30(5) =$ **10 candies**

(b) What is the equation for the line that goes through the points $(3, 5)$ and $(5, 12)$?

$m = \frac{12-5}{5-3} = \frac{7}{2}$ $\quad b = 5 - 3\left(\frac{7}{2}\right) = \frac{10}{2} - \frac{21}{2} = -\frac{11}{2}$

$y = \frac{7}{2}x - \frac{11}{2}$

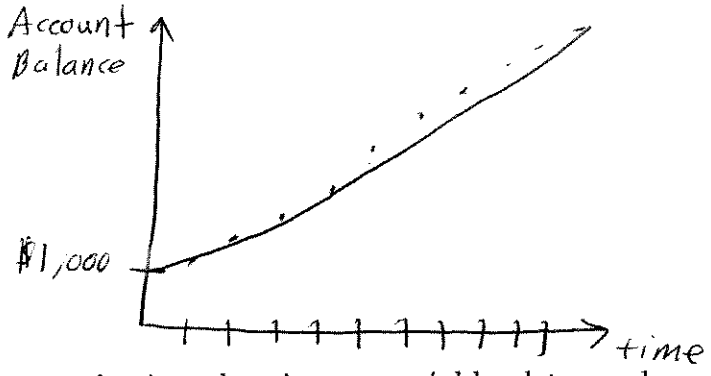
3. **Exponential Modeling**

(a) Suppose you start a bank account with \$1000 at a 4% interest rate.

i. Construct an exponential equation that models the growth of the money in this account.

$$A(t) = \$1000(1+.04)^t$$

ii. Construct a graph of this equation, representing how the amount of money in the account grows over time, for the first ten years of the accounts existence.



(b) The amount of a given drug in a person's bloodstream decreases by 10% each hour.

i. Construct an exponential model for how the amount of drug in the bloodstream decreases with time using the rate of change.

$$D(t) = D_0(.90)^t \qquad t \text{ in hours}$$

ii. What is the half-life of this drug in the bloodstream?

$$T_{1/2} = \frac{-\log(2)}{\log(.90)} = \boxed{6.58 \text{ hours}}$$