Math 105 - Team Homework Assignment 3, Fall 2013

• **Due Date:** September 26 or 27, 2013 (Your instructor will tell you the exact date and time.)

• Remember that all solutions to the Team Homework problems must be written out in complete sentences, showing all of your work - in much the same way that your textbook explains the example problems in each section. Please refer to more specific instruction under the “Doing Team Homework” and “Team HW Tutorial” links in the sidebar of the course website.

• *Do not forget to rotate roles and include a reporter’s page each week.*

1. On a normal day, Freckles the cat is fed 6 ounces of chicken and 2 ounces of tuna mixed together. Sometimes, Freckles will eat a different amount of chicken. Let \( P(c) \) be the percentage of chicken in her food mix if \(|c| < 0\) ounces of chicken have been added \((c > 0)\) or removed \((c < 0)\) from her normal mixture. Note again that her normal mixture has 6 ounces of chicken and 2 ounces of tuna in her food mix. For example \( P(2) \) is the percentage of chicken in her food mix if 2 more ounces of chicken have been added to her normal mix. \( P(-3) \) is the percentage of chicken in her food mix if 3 ounces of chicken have been removed from her normal mix.

   *Note: (1) The amount of tuna does NOT change. (2) By “percentage of chicken” we mean the ratio of the number of ounces of chicken in the mixture to the total number of ounces of food mixture.*

   (a) Find \( P(-1) \), \( P(0) \), and \( P(5) \). Interpret your answers in the context of this problem.

   (b) In the context of this problem, find the domain and range of \( P(c) \).

   (c) Find a formula for \( P(c) \) in terms of \( c \).

   (d) Freckles REALLY wants a food mixture with 93% chicken. How many ounces of chicken should be added to or removed from her normal food mixture for this to happen? How many total ounces of food will she end up with?

   (e) In the context of this problem, interpret the equation \( P^{-1}(N) = c \).

2. Due to the economy, Allie Alligator and Charlie Cheetah have raised their prices for walking a dog. Now, Allie Alligator now charges $10 per day and $3.50 per mile walked. Charlie Cheetah now charges $16 per day and $2.00 per mile walked. Barry Bear still charges $30 a day and nothing per mile walked.

   Seeing there isn’t much competition in the dog walking business, Sammy Salamander decides to get into the dog walking business. Sammy offers to walk dogs for the cheapest out of any of the competitors! To do this, Sammy decides to offer the best prices of the competitors.

   For example, if Allie charges the least to walk a dog for 10 miles, Sammy will charge what Allie would charge. If Barry charges the least to walk a dog for 2.5 miles, Sammy will charge what Barry would charge.

   Let \( S(m) \) be the amount Sammy charges for walking a dog \( m \) miles.

   (a) Evaluate and interpret \( S(1.5) \), \( S(5) \), and \( S(11) \).

   (b) Find a formula for the function \( S(m) \).

   (c) Sketch \( S(m) \) for \( 0 \leq m \leq 20 \).

   (d) Find the domain and range of \( S(m) \).
3. As a treat for local animals, sometimes a cup of ice is put out on the ground in local parks. Of course, how fast the ice melts or is consumed depends on the temperature outside. Let $V = A(T)$ be the average volume (in mL) of ice remaining when a cup of ice has been sitting in the Arb for five minutes when the average temperature in Ann Arbor is $T^\circ$ Celsius. Let $V = B(T)$ be the average volume (in mL) of ice remaining when a cup of ice has been sitting in Burns Park for five minutes when the average temperature in Ann Arbor is $T^\circ$ Celsius. (Assume that $A$ and $B$ are invertible functions.)

Let $T_0$ be the average temperature (in degrees Celsius) in Ann Arbor at 5 pm on September 23.

Explain the meaning of each of the following in terms of ice in a cup (in the Arb or in Burns Park).

(a) $A(29)$
(b) $A(30) - A(29)$
(c) $B(-5)$
(d) $B(T_0) < A(T_0)$
(e) $A^{-1}(T_0)$
(f) $A(B^{-1}(20))$

4. Do Problem 2.2.36 on page 79.