Math 120 A - Winter 2006
Mid-Term Exam Number Two
February 23, 2006
Hints and Answers

1. Start by finding Tessa's angular speed. Then, determine the angle that she moves through to reach the northernmost point. From this, you can determine the angle of her starting position (relative to the positive x-axis, in the counter-clockwise direction). Once you have that, you can determine her position at the end of her run with the "$(r\cos\theta, r\sin\theta)$" idea, and use the distance formula to get the answer.

   Version 1: distance = 269.14534 m

   Version 2: distance = 215.36168 m

2. Start by determining the multipart rule for each summand in the definition of $g(x)$. You will see there are three pieces of the x-axis to consider when adding them together.

   Version 1:

$$g(x) = \begin{cases} -2x+7 & \text{if } x < 2 \\ 3 & \text{if } 2 \le x \le 5 \\ 2x-7 & \text{if } x > 5 \end{cases}$$

   It is not one-to-one: g(2)=g(3), for instance.

   Version 2:

$$g(x) = \begin{cases} -2x+7 & \text{if } x < 1 \\ 5 & \text{if } 1 \le x \le 6 \\ 2x-7 & \text{if } x > 6 \end{cases}$$

   It is not one-to-one: g(2)=g(3), for instance.

3. The information given amounts to two points on the graph of the unknown function, and its horizontal asymptote. That's enough information to determine the function (some algebra required). Set that function equal to the desired IQ, and solve.

   Version 1: 163.125 days

   Version 2: 60 days

4. By drawing an appropriate sketch, introducing variables for the horizontal and vertical unknown lengths associated with the given angles, creating equations involving those lengths and the tangents of those angles, and doing a little algebra, the problem can be solved.

   Version 1: 4.60987 feet

   Version 2: 0.31257 feet