Professor Robert Smith?, University of Ottawa, MAT 1332, Fall 2012
Assignment 2, due Thursday September 27, 5:30pm at the beginning of class.
Late assignments will not be accepted; nor will unstapled assignments.

Student Name _____ Student Number _____

By signing below, you declare that this work was your own and that you have not copied from any other individual or other source.

Signature _____

1. Find the area between $f(x) = \sin(\pi x)$ and $g(x) = \cos(\pi x)$ for $-2 < x < 0$.
   (Hint: Sketch the curves.)

2. Suppose that energy is produced at a rate of

$$E(t) = |300t - 37t^2 + t^3|$$

where E is measured in joules per hour and t is measured in hours. Find the average energy generated between $t = 0$ and $t = 25$. (Hint: The rate is zero at times $t = 0$, 12 and 25.)

3. Consider a skinny snake that is 3 metres long, with a density described by

$$\rho(x) = 3 \times 10^{-5}x - 11 \times 10^{-8}x^2 + 10^{-3}$$

where ρ is measured in kilograms per centimetre and x is measured in centimetres from the tip of the tail.

(a) Find the minimum density of the snake.

(b) Find the maximum density of the snake.

(c) Where does the maximum occur?

(d) Where does the minimum occur?

(e) Find the total mass of the snake.

(f) Find the average density of the snake.

(g) How does the average density compare with the minimum and maximum?

(h) Graph the density and average.

(a)

(b)

(c)

(d)

(e)

(f)

(g)

(h)

4. A less-skinny 3-metre-long snake's body is given by rotating the function

$$y = \frac{1}{7}e^{-0.003x}$$

around the x-axis (the units of x and y are in centimetres). What is the volume of this snake?

5. Find the volume obtained by rotating $f(x) = \tan\left(\frac{x}{4}\right)$ around the x-axis between $-\pi$ and π. (Hint: Find the derivative of $g(\theta) = \tan(a\theta)$, where a is a constant.)