Prof. Frithjof Lutscher, University of Ottawa, MAT 1332, Winter 2009
Assignment 2, due January 28, 8:30am in class

Student Name _____ Student Number _____

DGD 1 (FTX 227) DGD 2 (CBY B012) DGD 3 (TBT 070) DGD 4 (MCD 121)

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 _____

No part marks will be given.

[2] 1. Find the area between $f(x) = \sin(4x)$ and $g(x) = \cos(4x)$ for $-\frac{\pi}{2} \leq x \leq 0$.
(Hint: Sketch the curves.)

[2] 2. Suppose that energy is produced at a rate of

$$E(t) = \left|360t - 39t^2 + t^3\right|$$

where E is measured in joules per hour and t is measured in hours. Find the total energy generated from $t = 0$ to $t = 24$.
(Hint: The rate is zero at times $t = 0$, 15 and 24.)

[3] 3. Consider a snake that is 2 metres long, with a density described by

$$\rho(x) = 1.0 + 2.0 \times 10^{-8} x^2 (240 - x)$$

where ρ is measured in grams 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) Find the total mass of the snake.
(e) Find the average density of the snake.
(f) Sketch the density and average.

[2] 4. Solve

$$\int \frac{x^3 + 1}{x^2 + 3} dx.$$

[2] 5. Solve

$$\int \frac{x^4 + 3}{x^2 - 2x - 3} dx.$$

[2] 6. Find the volume obtained by rotating $f(x) = \cos\left(\frac{x}{2}\right)$ around the x-axis, between $-\pi$ and π.