RMIT UNIVERSITY

Student Name_____

Student Number_____

Teacher's Name_____

Science, Engineering & Technology Portfolio

School of Life and Physical Sciences

MATH 5156

Aerospace Mathematics 1

Assignment 2

Semester 1
2010

Submission Details:

Due Date**: Friday**, **28th May 2010 by 5pm.**

- Hand in the assignment to the reception in **Building 51, level 6**.
- Assignments handed in anywhere else WILL NOT be accepted.
- Clearly specify your teacher's name on the coversheet.

Instructions:

1. Show all working and answer.
2. This assignment consists of **5** questions and totals **50** marks.
3. This assignment contributes **5%** of the final marks in this subject.

Question 1

Find the indefinite integrals

(a) $\int 3x^2 + 5\cos(x) + 2x\sec^2(x^2)dx$

(b) $\int \frac{x+4}{x^2+8x+4}dx$

(c) $\int \frac{1}{x(x^2+1)}dx$

(d) $\int \sin^4(x)\cos(x)\,dx$

(e) $\int e^{\sin(5x)}\cos(5x)dx$

(3 + 3 + 3 + 3 + 3 = 15 marks)

Question 2

Evaluate the following integrals

(a) $\int_0^1 xe^{x^2}\,dx$

(b) $\int_0^{\pi/2} x^2\cos x\,dx$

(c) $\int_1^3 x\log(x) + \log(x)\,dx$

(d) $\int_1^2 \frac{4x+7}{(x+3)(x^2+1)}\,dx$

(3 + 3 + 3 + 6 = 15 marks)

Question 3

(a) Sketch the (finite) region *R* which is bounded by the graphs of $y = x^2$ and $y = 1$.

(b) Calculate the area of the region *R*.

(2 + 3 = 5 marks)

Question 4

(a) Sketch the (finite) region *R* which is bounded by the graphs of $y = x^2 + 2x - 4$ and $y = 2x$ between $x = 0$ and $x = 4$.

(b) Calculate the area of the region *R*.

(2 + 3 = 5 marks)

Question 5

A ball, initially at rest, is dropped from a height of 1000 meters. The acceleration due to gravity is $9.8m/s^2$.

(a) Derive the equation for the velocity of the ball with respect to time *t*.
(b) Derive an equation for the displacement of the ball at time *t*.
(c) After how much time will the ball hit the ground?
(d) What is the velocity with which the ball hits the ground?

(2+2+3+3 = 10 marks)