Mathematics for Actuarial Science (AS1051)

Coursework

This is an assessed coursework, and will count towards your final grade. Solutions should be handed in to the SEMS general office (C108) by the stated deadline. Late submissions will be penalised.

DEADLINE: Monday 03/12/2012 at 16:00

1) *i)* Solve the equation [10 marks]

$$\sqrt{12}\cos^2\theta - \sin 2\theta = 0,$$

for θ, giving your general solution in radians as multiples of π.

ii) Solve the equation

$$\log_3(x) = \log_{27}(|2x^2 + 5x - 6|)$$

for at least two values of x.

2) Using the notation [10 marks]

$$I_n := \int \cos^n\theta d\theta,$$

find a recursive equation which expresses I_n in terms of I_{n-2}. Use your result to compute I_6 and I_7.

3) Solve the inequality [8 marks]

$$\left|\frac{3x+15}{x-2}\right| < \frac{2x+1}{x-4}.$$

4) *i)* Reexpress [16 marks]

$$f(x) = \frac{6x^5 + x^2 + x + 2}{(x^2+2x+1)(2x^2-x+4)(x+1)}$$

in terms of partial fractions.

ii) Differentiate the result from *i)* at $x = 0$ and $x = 1$.

iii) Compute the indefinite integral $\frac{1}{5}\int f(x)dx$ using the result from *i)*.

5) Find x such that [6 marks]

$$\arctan\left(\frac{3}{2}\right) + \arctan\left(\frac{5}{4}\right) + \arctan\left(-\frac{5}{2}\right) + \arctan\left(-\frac{8}{3}\right) = \arctan x$$