MAT1236D: CALCULUS 1
ASSIGNMENT 1
DUE DATE: MONDAY 4th March 2013 at 1:30 PM

The purpose of this assignment is to enable students to develop and demonstrate their knowledge, understanding and skills by solving problems from the unit content.

Submission Guidelines:

1. Full marks will be gained by complete solutions to all questions. Total marks for each question are given. Where a question consists of more than one part the parts need not carry equal marks.

2. Answer the questions in the order given and start each question (not each part of a question) on a new page.

3. Be clear and concise. Show all of your working. Answers to the assignment problems need to be written up in grammatically correct English and on plain white paper. Failure to do so will result in deduction of marks.

4. The assignment solutions must be your own work. Each submission from your assignment must have a completed coversheet attached and be submitted on or before the due date. You are reminded of the declaration:

   "I certify that the attached assignment is my own work and that any material drawn from other sources has been acknowledged".

   that you sign when you complete the coversheet.

5. In the interests of fairness, extension of time for submission of the assignment questions will be given only in exceptional circumstances, and then only in accordance with PIBT rules.

6. This assignment contributes 10% to the total mark for this unit.

Question 1

Find the derivative $\frac{dy}{dx}$ of the following functions:

(a) $y=(x+1)^2\left(x^2+3x+1\right).$

(b) $y=\frac{1+\cos x}{1-\sin x}.$

(c) $y=2\ln\left(\frac{1-x}{1+x}\right).$

(d) $y=e^{x^3-2\sqrt{x}}.$

(e) $y=x\tan^{-1}x+\frac{1}{2}\ln x.$

(f) $y=x\sin^{-1}x+\sqrt{1-x^2}.$

[15 Marks]

Question 2

Consider the function

$$f(x)=\tan^{-1}\left(\sqrt{x}\right)+\frac{1}{2}\ln\left[\frac{\left(\sqrt{x}+1\right)^2}{x+1}\right].$$

a) What is the value of $\tan^{-1}\left(\sqrt{3}\right)$ in radians?

b) What is the domain of f?

c) What is the value of the function at $x=3$?

d) Show that $\frac{d}{dx}f(x)=\frac{1}{\sqrt{x}\left(\sqrt{x}+1\right)(x+1)}.$
[Hint: Use the properties of logarithms on $f(x)$ before differentiating]

e) What is the domain of f'?

f) Find the equation for the tangent and normal line to the curve at $x=3$.

[15 Marks]