AMA1131 Calculus
Assignment 2

Due Date Friday 22 November 2024, before 11:59pm.

- **Put the following information on the top right corner of the front page of your homework.**

  - **Your name and student number**
  - **Subject code: AMA1131**
  - **Subject lecturer: Dr Bob He**

- **You should finish all questions.**

- **Photograph your solutions onto a PDF file named YourName_StuID, otherwise the marker (not the lecturer) cannot write on your solution, then you cannot see the marking but only the score.**

- **You may use the app "CamScanner" or other softwares. Make sure that the file is complete, legible, in correct order and orientation.**

- **Upload/attach your homework solution pdf file at the same place you've downloaded this homework by pressing the "Browse My Computer", then choose your pdf file, and then press Submit. You may re-submit the homework again, to a maximum of twice, before the due time. After submitting, check and make sure your submission is successful.**

- **No late submission is allowed. It may not be marked.**

1. **Show that the function** $f(x) = e^x - \frac{1}{2} - \cos(2x) + 2\sin x$ **is one to one in the interval** $\left[0, \frac{\pi}{4}\right]$. **Then find** $(f^{-1})'(-\frac{1}{2})$. **[20 marks]**

2. **Suppose the equation** $\cos(x^2+2y)+5xe^y = \tan^{-1}(y)+1+6y$ **defines a function** $y = y(x)$. **Find the derivative** y' **at** $(x, y) = (0, 0)$. **[10 marks]**

3. **Find increasing intervals, decreasing intervals, local maxima, local minima, global maximum and minimum of the function**
   $f(x) = -2x^3 - 3x^2 + 12x - 7$ **on** $[-4, 2]$. **[10 marks]**

4. **Find the following integrals.** **[60 marks]**

   (a) $\int \left(\frac{2x^3 - 4x + 7}{x^2}\right) dx$

   (b) $\int \frac{x}{\sqrt[3]{x+8}} dx$

   (c) $\int \frac{e^{2x}}{\sqrt{1 - e^{4x}}} dx$

   (d) $\int \frac{\sin(2x)}{5 + \cos^2(x)} dx$

   (e) $\int \frac{1}{\sqrt{x(4 - x)}} dx$

   (f) $\int \sin(8x) \sin(4x) dx$

   (g) $\int 32 \sin^2 x \cos^2 x \, dx$

   (h) $\int e^{\sin^2 x} \sin(2x) dx$

   (i) $\int \sqrt{x} \ln x \, dx$

   (j) $\int x \cos^5 x \, dx$

   (k) $\int \frac{x^2}{(x - 1)(x - 2)^2} dx$

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