HOLIDAY ASSESSMENTS

APPLIED MATHEMATICS

JANUARY 2025

1. a) show that the equation $x^3 - e^x = x$ has a root between 2 and 3. Hence use linear interpolation to find a better estimate to the root, correct to three decimal places.
   b) Hence use Newton Raphson method to find the root correct to two decimal places.
2. a) Show that Newton's iterative formula for solving the equation.

$$x^5 - 3x^2 + 1 = 0 \; is \; x_{n+1} = \frac{x_n\left(4x_n^3 - 3 - \frac{1}{x_n^2}\right)}{5x_n^3 - 6}$$

   b)Taking the first approximation to the largrest positive root at 1.5, draw a flow chart diagram which reads the initial approximation to the root , prints the number of iterations and the root with an error of less than 0.001.

   c)Perform a dry run of the flow chart .

3. a)Using a trapeizum rule with 7 ordinates, estimate $\int_0^{\frac{\pi}{2}} \frac{1}{1+cosx}\,dx$correct to 3 decimal places.

b)Calculate the percent error in your estimation in (a) above.

4. a)By plotting graphs of y=3-Inx and y=2x, show that the equation Inx+2x-3=0 has a root between 1 and 2.

   b)Hence use Newton Rapson's method to find the root of the equation correct to 3 decimal places

5. a)The table below shows values of x and the corresponding values of $\int(x)$:

x	2.8	3.5	4.0	5.5
f(x)	7.4	8.8	9.2	11.1

   b) Use linear interprolation or extrapolation to find

   (i) *f(3.0)* *ii)* $f^{-1}(12.2)$

6. Use the trapezium rule with six ordinatesto estimate $\int_1^{2.5} \frac{x(x+1)}{x^2+1}\,dx$ correct to 2 decimal places