1. By substituting $u = 1 + e^x$, evaluate $\int_0^1 \frac{e^x}{1+e^x} dx$. Give your answer in terms of e.

[6 marks]

2. Evaluate $\int_1^2 x^2 \ln 3x dx$ correct to three decimal places.

[6 marks]

3. By using separable variable method, find the general solution of the differential equation $\frac{dy}{dx} = \frac{y}{2(x-1)}$. Hence determine the particular solution if y = 2 when x =5.

[7 marks]

4. Given $e^x = 4 - x$.

   a) Show that there is a real root between 1 and 2.

   [3 marks]

   b) Hence by using the Newton the Newton-Raphson method, find the root of the equation, correct to four significant figures, by taking $x = 1.2$ as the first approximation.

   [4 marks]

5.

   a) Find the area or the region bounded by the curve $x = y^2$ and the straight line $y + x - 2 = 0$.

   [7 marks]

   b) The region bounded $y = x^2 + 3x, x = -3$ and $x = -1$ is rotated completely about the *x-axis*. Find the volume of the solid formed.

   [5 marks]

6.

   a) A circle with centre (4,-2) passes through the points (10,6) and (*a*, 8). Find
      i. the value of *a*
      ii. the general equation of the circle.

   [7 marks]

   b) Find the standard equation of a parabola with its symmetric axis parallel to the *x-axis*, vertex at the point (3,2) and passing through the point (4,4).

   [5 marks]

END OF QUESTION

Final Answer

1. $\ln\left(\frac{1+e}{2}\right)$

2. 3.634

3. $y=\sqrt{x-1}$

4. a) $f(1)=-0.2817$
   $f(2)=5.389$

   b) 1.0737

5. a) $\frac{9}{2}unit^2$

   b) $\frac{32}{5}\pi unit^3=20.1unit^3$

6. a)

   i. $a=4$

   ii. $x^2+y^2-8x+4y-80=0$

   b) $(y-2)^2=4(x-3)$