

1. Solve $(s^2 + 1)\frac{dr}{ds} = rs$ for $r = 1, s = 2$ and show that $5r^2 = s^2 + 1$. **[7 marks]**

2. By using Newton Raphson method, approximate $\sqrt{6}$ correct to 3 decimal places. **[7 marks]**

3. Find the equation of parabola with vertex $(0,8)$ and directrix at $x = -4$. Sketch the graph. **[7 marks]**

4. a) Find $\int \frac{1}{x^2} (4 - 3x^4) dx$ **[3 marks]**

b) By using the substitution $u = x - 1$, show that $\int_2^3 \frac{x}{(x-1)^2} dx = \ln 2 + \frac{1}{2}$ **[5 marks]**

5. Find the equation of the tangent and the normal to the circle $2x^2 + 2y^2 - 2x - 5y + 3 = 0$ at point $(1,1)$. **[9 marks]**

6. Sketch the following graphs on the same axes. $y = e^x, y = -x + 1, x = 1$
 - a. Shade the region bounded by three graphs above.
 - b. Find the area and volume of the shaded region**[12 marks]**

END OF QUESTION

Final Answer

1. shown

2. $x = 2.449$

3. a) $(y - 8)^2 = 16x$

4. a) $-\frac{4}{x} - x^3 + c$

5. Equation tangent $y = 2x - 1$ Equation normal $2y + x - 3 = 0$

6. Area = $e - \frac{3}{2} \text{unit}^2$ volume = $\left(\frac{e^2}{2} - \frac{5}{6}\right)\pi \text{unit}^3$