1. Use the Newton-Raphson method to estimate $\sqrt[3]{4}$ correct to three decimal places.

[7 marks]

2. A circle passes through the point (5,2) and touches the line $y+x=9$ at the point (3,6). Find the coordinates of the centre and the radius of the circle. Hence, state the standard equation of the circle. **[7 marks]**

3. Determine the general equation of the differential equation $x\dfrac{dy}{dx}-y=3x^2$.

   Hence find the particular solution for $y(2)=0$. **[7 marks]**

4. Sketch, on the same coordinate axes, the curves $y=e^x$ and $y=2+3e^{-x}$. **[2 marks]**

   Calculate the area of the region bounded by the $y-$axis and the curves. **[5 marks]**

5. (a) Find the foci of $4x^2+9y^2=36$ and sketch its graph. **[4 marks]**

   (b) By using implicit differentiation, find the gradient of the tangent to the curve $4x^2+9y^2=36$. Hence, find the coordinates on the curve with gradient $\dfrac{2}{9}$.

[6 marks]

6. (a) Find $\int \dfrac{3x}{e^x}dx$ **[5 marks]**

   (b) Find the values of A, B and C which satisfy

$$\frac{x+2}{(1-x)(x^2+2)}=\frac{A}{1-x}+\frac{Bx+C}{x^2+2}$$ **[4 marks]**

   Hence, find $\int \dfrac{x+2}{(1-x)(x^2+2)}dx$. **[3 marks]**

END OF QUESTION

Final Answer

1. 1.587

2. centre $= (-2,1)$; radius $= 5\sqrt{2}$; the equation of circle is $(x+2)^2 + (y-1)^2 = 50$

3. $y = 3x^2 + cx$; $y = 3x^2 - 6x$

4. Area $= 2.20$ units^2

5. a) Foci $= \left(\sqrt{5},0\right)$ and $\left(-\sqrt{5},0\right)$.

   b) $\frac{dy}{dx} = -\frac{4x}{9y}$; Coordinates = $\left(\frac{3\sqrt{10}}{10}, -3\sqrt{\frac{2}{5}}\right)$ and $\left(-\frac{3\sqrt{10}}{10}, 3\sqrt{\frac{2}{5}}\right)$

6. a) $-3e^{-x}\left[x+1\right]+c$

   b) $A = 1,\ B = 1,\ C = 0$

   $$-\ln|1-x| + \frac{1}{2}\left[\ln\left|x^2+2\right|\right] + C$$