



1) (10 pts) Find the length of the curve:

$$x = 9 \cos^3 t \text{ and } y = 9 \sin^3 t \text{ when } 0 \leq t \leq \frac{\pi}{4}$$

2) (10 pts) Find the cosine of the angle between the 2 vectors:

$$\vec{u} = 3\vec{i} + 4\vec{j} \text{ and } \vec{v} = 2\vec{i} - \frac{\vec{j}}{2}$$

3) (15 pts – 5 pts each) Solve the following

a) $\int \frac{\cos(3 \ln x)}{x} dx$

b) $\int \frac{dx}{2 + e^x}$

c) $\int \frac{(1 + \sqrt{x})^{\frac{1}{3}}}{\sqrt{x}} dx$

4) (10 pts) Evaluate $\frac{dy}{dx}$ using logarithmic differentiation

$$y = \frac{(x^2 + 3x) \cos(x^2) \tan^{-1}(3x)}{\sqrt[3]{(x+2)^2(x-1)^5} \cdot [e^{5x+4}]}$$

5) (15 pts – 5 pts each) Find $\frac{dy}{dx}$ of the following functions

a) $e^{x^2} + y = \cos^{-1}(xy)$

b) $y = \ln\left(\frac{5x^2 e^{-3x}}{\ln x + 4}\right)$

c) $5\sqrt[3]{2xy} = 3y^2 - 2$

6) (10 pts) Find the volume generated by revolving the region bounded by the curves $y = e^x$, $y = e$ and $x=0$ about the x-axis.

7) (10 pts) Find the length of the curve: $y = x^2 - \frac{\ln x}{8}$ when $1 \leq x \leq 2$



8) (20 pts – 10 pts each)

a) Find the volume of the solid generated by rotating the region

$$0 \leq y \leq x^3 \text{ and } 0 \leq x \leq 1 \text{ about the line } y = 1$$

b) Compute the volume of the solid generated by revolving the triangular region bounded by the lines $2y = x + 4$, $y = x$ and $x = 0$ about the line

$x = 4$ using the Shell Method

BONUS:(10 PTS)

Solve the following integrals

a)
$$\int_1^{\sqrt[4]{e}} \frac{\tan^2 \pi \ln^2 x}{x} dx$$

b)
$$\int \frac{\sec^2 x}{1 + \tan^2 x} dx$$