b) Find the area of the region bounded by the curves $x = y^2$, $x + y = 6$, $y = -4, y = 2$.

c) Set up integrals for the volume obtained by revolving the region bounded by $y = 2x^2, y = 8x$ about the lines

(i) $x = 5$,

(ii) $y = -1$.

Exercise 5 : (3+3+3)

a) Find the area of the surface obtained by revolving the curve $x = 2y^3$, $0 \leq y \leq 1$, about the $y-$ axis .

b) Find the area of the region inside the polar curve $r = 1$ and outside $r = 1 - \cos\theta$.

c) Compute the arc length of the curve $r = 1 + \cos\theta$.

King Saud University

Faculty of Sciences

Department of Mathematics

Final Examination	Math 106	Semester I	1438-1439	Time: 3H

Exercise 1 : (2+3)

a) If $F(x) = \int_{2x}^{x^2} t \ln t dt$, $x > 0$, find $F'(x)$.

b) Approximate $\int_0^5 \frac{dx}{\sqrt{1+x^4}}$ using the trapezoidal rule with $n = 5$.

Exercise 2 : (3+3+2)

a) Evaluate $\int x 3^{2x^2} (3^{2x^2} + 1)^{-4} dx$.

b) Find $\int \frac{(\log_2 x)^2 + \sqrt{x}}{x} dx$.

c) Compute $\int \frac{dx}{\sqrt{e^{4x} - 36}}$.

Exercise 3 : (3+3+3)

a) Find $\int \ln(x^2 + 1) dx$.

b) Evaluate $\int \frac{dx}{x^3\sqrt{x^2 - 1}}$.

c) Compute $f'(x)$ if $f(x) = x^2(x^2 + 1)^{(x^3+1)}$.

Exercise 4 : (3+3+3)

a) Find $\int \frac{3x - 1}{x^2 + 4x + 8} dx$.