KING SAUD UNIVERSITY | **First Semester 41**

Math Department | **December 15 2019**

Final exam106 | **Time: 180mn**

Question 1(2+2+3)

a) Find the number c in the mean value theorem for $f(x) = -x^2 + 4x$ on [0, 3]

b) Compute the integral $\int \frac{dx}{\sqrt{5^x - 16}}$

c) Evaluate $\int \frac{cotxdx}{\sqrt{9-(sinx)^4}}$

Question 2(3+3+3)

a) Compute $\lim_{x\to 3}(\frac{1}{x-3} - \frac{1}{\ln(x-2)})$

b) Find $\int x^2 \tan^{-1}(x)dx$

c) Evaluate the integral $\int (tanx)^4 (secx)^6 dx$

Question 3(3+3+3)

a) Compute the following integral $\int \frac{x^2 dx}{(x^2+9)^{3/2}}$

b) Find the integral $\int \frac{(3x-2)dx}{(x^2+4)(x+2)}$

c) Evaluate the integral $\int \frac{dx}{3-sinx+cosx}$

Question 4(3+2+1)

a) Sketch the region bounded by the curves: $y = 4 - x^2, y = x + 2$ $x = -3, x = 0$ and find its area.

b) Find the volume obtained by revolving the region bounded by the curves $y = -x^2 + 2,\ y = 1$ about the line of equation $x = 3$

c) Set up an integral for the volume obtained by revolving the region in part b) about the line of equation $y = 4.$

Question5(3+3+3)

a) Find the length of the curve given by $r = (\cos(\frac{\theta}{2}))^2,\ 0 \leq \theta \leq \pi.$

b) Sketch the region R that lies inside the curve $r = 1 - sin\theta$ and outside the curve $r = 1$ and find its area.

c) Find the area of the surface obtained by revolving the curve $r = 2cos\theta \quad 0 \leq \theta \leq \pi/4$ about the y-axis.