

King Saud University  
Faculty of Sciences  
Department of Mathematics

Final Examination    Math 106    Semester I - 1442  
Time: 3H

Question 1 : (2+2+3)

- a) Use Trapezoid rule with  $n = 5$  to approximate  $\int_0^5 \frac{dx}{1+x^3}$ .
- b) Find the number(s)  $c$  that satisfies the conclusion of the mean value theorem for  $f(x) = (x-2)^2$  on  $[-1, 5]$ .
- c) Evaluate the integral  $\int x \sin(x^2) 3^{\cos(x^2)} dx$ .

Question 2 : (3+3+3)

- a) Evaluate the integral  $\int \frac{dx}{x\sqrt{x^4-1}}$ .
- b) Compute the integral  $\int \frac{\cot x dx}{\sqrt{1-\sin^4 x}}$ .
- c) Find the indefinite integral  $\int \cosh^{-1} x dx$ .

Question 3 : (3+3+3)

- a) Compute the integral  $\int \frac{dx}{(x^2+4)^2}$ .
- b) Evaluate the integral  $\int \frac{dx}{x^{\frac{1}{2}} - x^{\frac{1}{3}}}$ .
- c) Find  $\int \frac{dx}{5+3\cos x+4\sin x}$ .

Question 4 : (3+3+3)

- a) Does the integral  $\int_0^{+\infty} (1+x)e^{-2x} dx$  converge? Find its value if it does.

b) Sketch the region bounded by the curves  $y = (x-1)^2$ ,  $y = (x+1)^2$ ,  $y = 0$  and find its area.

c) Find the volume obtained by revolving the region bounded by  $y = x^2$  and  $y = \sqrt{x}$  about the  $x$ -axis.

**Question 5 : (3+3)**

a) Compute the area of the surface of revolution obtained by revolving the parametric curve  $x = -2 + 2t^2$ ,  $y = 4t$ ,  $0 \leq t \leq 1$ , about the  $x$ -axis.

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