

King Saud University
Faculty of Sciences
Department of Mathematics

Final Examination Math 106 Semester I - 1443
Time: 3H

Question 1 : (2+2)

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

b) Find the number(s) z in the mean value theorem for $f(x) = \frac{1}{x^2}$ on $[1, 2]$.

Question 2 : (3+3+3)

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

b) Compute $\int \frac{\cot x}{\sqrt{1 - \sin^2 x}} dx$.

c) Find $\lim_{x \rightarrow 0^+} x^{\sin x}$.

Question 3 : (3+3+3)

a) Compute the integral $\int x \tan^{-1} x dx$.

b) Evaluate $\int \frac{dx}{(1+x^2)^2}$.

c) Find $\int \frac{dx}{\sqrt{x^2 + 8x + 25}}$.

Question 4 : (3+3+3)

a) Evaluate the integral $\int \frac{dx}{x^{\frac{1}{4}} + x^{\frac{1}{2}}}$.

b) Does the integral $\int_2^{+\infty} \frac{dx}{x(\ln x)^3}$ converge? Find its value if it does.

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

Question 5 : (3+3+3)

a) Find the volume obtained by revolving the region in the first quadrant bounded by $y = 4 - x^2$, $y = 0$ and $x = 0$ about the y -axis.

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

c) Sketch the region inside $r = 1 + \cos \theta$ and outside $r = 1 - \cos \theta$ and find its area.

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First Examination Math 106 Semester I
November 2021 Time: 2H

1. Use Simpson's rule, with $n = 4$, to approximate the integral $\int_1^3 \sqrt{1+x^2} dx$.
2. Evaluate the integral $\int \frac{(1 - \frac{1}{x^2})^5}{x^3} dx$.
3. Find $\frac{dy}{dx}$ if $y = \sqrt{x} \cdot \sqrt[3]{x+2} \cdot \sqrt[5]{x-1}$.
4. Evaluate the integral $\int \frac{(\sec x)^2}{\sqrt{4 - (\tan x)^2}} dx$.
5. Compute the integral $\int \frac{dx}{\sqrt{e^{2x} - 1}}$.
6. Find the indefinite integral $\int \frac{dx}{x\sqrt{1-x^5}}$.
7. Compute $\lim_{x \rightarrow 0} \frac{\cos x - 1 + \frac{x^2}{2}}{x^4}$.
8. Integrate by parts twice to compute $\int (\ln x)^2 dx$.
9. Find $\int (\tan x)^5 (\sec x)^3 dx$.
10. Evaluate the integral $\int \frac{x^2}{\sqrt{9-x^2}} dx$.
11. Compute the indefinite integral $\int \frac{x^2 + 8x + 10}{x^2 + 6x + 11} dx$.