King Saud University

Faculty of Sciences

Department of Mathematics

Second Examination	Math 106	Semester I	1439-1440	Time: 1H30

Exercise 1 : (2+3+3)

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

b) Find $\displaystyle\int \frac{\tan x}{\sqrt{4-\cos^4 x}}dx$.

c) Find $\displaystyle\lim_{x\longrightarrow 0} \frac{1}{x} - \frac{1}{\sin x}$.

Exercise 2 : (3+2+3)

a) Compute $\displaystyle\int e^{2x}\sin x dx$.

b) Evaluate $\displaystyle\int \sec^4 x \tan^7 x dx$.

c) Find $\displaystyle\int \frac{dx}{x^3\sqrt{x^2-4}}$.

Exercise 3 : (3+3+3)

a) Find $\displaystyle\int \frac{6x^2+x+8}{x^3+4x}dx$.

b) Compute $\displaystyle\int \frac{dx}{(x+1)^{\frac{5}{6}}-(x+1)^{\frac{1}{2}}}$

c) Evaluate $\displaystyle\int \frac{dx}{2+\cos x}$

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Exercise 1 : (3+3+2)

a) If $F(x) = \ln(2x) \int_1^{4x^2} (1+t^2)^{10} dt$. Find $F'(\frac{1}{2})$.

b) Use Riemann sums to find the value of $\int_0^2 3x^2 dx$.

c) Use Trapezoid rule with $n = 4$ to approximate the integral $\int_0^{\pi} \sin^4(x) dx$.

Exercise 2 : (2+3+3)

a) If $f(x) = \log_2(\sin^{-1}(x))$, $x > 0$. Find $f'(x)$.

b) Compute the integral $\int \frac{4^{-\ln(x)}}{x} dx$.

c) If $y = x^{2x^2}(x-1)^{\frac{3}{2}}$, $x > 1$. Find y'.

Exercise 3 : (3+3+3)

a) Evaluate the integral $\int \frac{2x+3}{\sqrt{4-x^2}} dx$.

b) Find $\int \frac{e^{\frac{x}{2}}}{7+e^x} dx$.

c) Compute the integral $\int \frac{\sin(x)}{\sqrt{e^{\cos(x)}-1}} dx$.

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Final Examination	Math 106	Semester I	1439-1440	Time: 3H

Exercise 1 : (2+2)

1. Approximate $\int_0^4 \sqrt{x^3+8}dx$ using Simpson's rule with $n = 4$.
2. If $F(x) = (2+\sin(x))^{e^x}$, find $F'(x)$.

Exercise 2 : (3+3+3)

1. Evaluate $\int \frac{(3^x+1)^2}{3^x}dx$.
2. Find $\int \frac{dx}{\sqrt{2^{2x}-1}}$.
3. Compute $\int \frac{dx}{\sqrt{x}\sqrt{1+x}}$.

Exercise 3 : (3+3+3)

1. Compute $\int \frac{dx}{x\sqrt{4-x^6}}$.
2. Evaluate $\int \frac{dx}{(x^2-1)^{\frac{3}{2}}}$.
3. Find $\int \frac{4x^2}{(x-1)^2(x+1)}dx$.

Exercise 4 : (3+3+3)

1. Does the integral $\int_0^{+\infty} (1+2x)e^{-x}dx$ converge? Find its value if it does.
2. Sketch the region bounded by $y = (x-1)^2$, $y = 3-x$ and the $x-$axis and find its area.
3. Sketch the region bounded by $x = y^2 + 2$ and $x = 4 - y^2$ and set up an integral for the volume obtained by revolving the region about the line of equation $x = -1$.

Exercise 5 : (3+3+3)

1. Find the length of the curve given by: $x = \frac{t^3}{3}$, $y = \frac{2}{9}t^{\frac{9}{2}}$, $t \in [0,1]$.
2. Sketch the region inside the polar curve $r = 3 + 3\cos(\theta)$ and to the left of the $y-$axis and find its area.
3. Find the area of the surface obtained by revolving the curve of equation $r = 8\cos(\theta)$, $\theta \in [0, \frac{\pi}{2}]$ about the $y-$axis.