

King Saud University
Faculty of Sciences
Department of Mathematics

Final Examination Math 106 Trimester II - 1444
Time: 3H

Question 1 : (2+2+3)

1. If $F(x) = \int_{x^2+1}^6 \cos \sqrt{t^2 + 1} dt$. Find $F'(x)$.

2. Compute $\int \frac{dx}{x((\ln x)^2 + 9)}$

3. Evaluate the integral $\int \frac{dx}{x\sqrt{1-x^6}}$

Question 2 : (3+3+3)

1. Find $\lim_{x \rightarrow 0^+} \left(\frac{1}{x}\right)^{x^2}$.

2. Compute the indefinite integral $\int x^4 \ln x dx$.

3. Evaluate $\int (\sin x)^5 (\cos x)^6 dx$.

Question 3 : (3+3+3)

1. Compute $\int \frac{dx}{(16-x^2)^{\frac{3}{2}}}$.

2. Evaluate $\int \frac{x^2 + 1}{x^3 - x} dx$.

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Midterm Exam

Math 106

January 2023

Question 1 : (2+3+3+2+3+3)

1. Let $F(x) = \int_{2x}^{x^2} \frac{dt}{1+t^4}$. Find $F'(x)$.

2. Use Trapezoid rule with $n = 4$ to approximate the integral $\int_0^4 \frac{dx}{\sqrt{1+x^3}}$.

3. Find the number c that satisfies the conclusion of the mean value theorem for the function $f(x) = \sqrt{x+3}$ on $[-2, 6]$.

4. Evaluate the integral $\int \frac{x^2 e^{4x^3}}{1+e^{4x^3}} dx$.

5. Use logarithmic differentiation to find $\frac{dy}{dx}$ if $y = x^{2x} \frac{(1+x^3)^{\frac{4}{3}}}{(3+x^2)^{\frac{3}{2}}}$.

6. Compute the integral $\int \frac{x5x^2}{1+5^{2x^2}} dx$.

Question 2 : (3+3+3+3+2)

1. Compute $\int \frac{dx}{x \ln x \sqrt{(\ln x)^4 - 1}}$, ($x > e$)

2. Find the indefinite integral $\int \frac{dx}{x\sqrt{4-x^4}}$, ($0 < x < 2$).

3. Evaluate the integral $\int (1 + \frac{1}{x}) \ln x dx$.

4. Find $\int (\tan x)^4 (\sec x)^4 dx$

5. Compute the integral $\int \cos(6x) \cos(2x) dx$.

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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 $\int \frac{x^2 + 8x + 10}{x^2 + 6x + 11} dx$.

April 2022

Math 106 midterm(120mn)

Part 1[2+2+3+2+3+3+3]

a) Use Trapezoid rule, with $n = 4$, to approximate $\int_0^4 x^2 \sqrt{1+x^2} dx$

b) Find the number α so that $\sum_{k=1}^n (2k + \alpha) = n^2$

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

d) If $y = (2 + \sqrt{x})x^2$, compute $\frac{dy}{dx}$

e) Evaluate the integral $\int \frac{e^{5x}}{e^{10x}+16} dx$

f) Find the indefinite integral $\int \frac{dx}{x\sqrt{x^6-4}}$

g) Compute $\int \frac{dx}{x\sqrt{9+(\ln x)^2}}$

Part 2[3+3+3+3]

a) Evaluate $\int x \tan^{-1} x dx$

b) Find $\int (\sin x)^5 (\cos x)^4 dx$

c) Evaluate the integral $\int \frac{1}{(4-x^2)^{3/2}} dx$

d) Compute the indefinite integral $\int \frac{6x+6}{(x-4)(x+2)} dx$

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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.

Final exam Math106

Question 1(2+3)

a) Let $F(x) = \int_2^{e^x} \ln t dt$. Find $F'(1)$.

b) Find the number(s) c that satisfies the conclusion of the mean value theorem for the function $f(x) = \frac{x}{\sqrt{x^2+16}}$ on $[0, 3]$.

Question 2(2+3+3)

a) Evaluate the integral $\int \frac{5^x dx}{5^{2x+4}}$

b) Compute the integral $\int \frac{x-3}{x\sqrt{x^2-25}} dx$

c) Find the indefinite integral $\int \sinh^{-1} x dx$

Question 3(3+3+3)

a) Find $\lim_{x \rightarrow +\infty} (e^x + x)^{\frac{1}{x}}$

b) Evaluate the integral $\int \frac{\sqrt{9-x^2}}{x^2} dx$

c) Compute $\int \frac{9x^2-20x+10}{x^3-3x^2+2x} dx$

Question 4(3+3+3)

a) Find $\int \frac{dx}{\sqrt{x^2+2x+5}}$

b) Does the integral $\int_1^3 \frac{dx}{\sqrt[3]{x-1}}$ converge? Find its value if it does.

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

Question 5(3+3+3)

a) Find the volume of the solid obtained by revolving the region bounded by $y = 4 - x^2$ and $y = 4 - 2x$ about the y -axis.

b) Compute the arc length of the curve $y = \cosh x$, $0 \leq x \leq 1$.

c) Sketch the region inside $r = 2\sin\theta$ and outside $r = 2 - 2\sin\theta$ and find its area.