

King Saud University
Faculty of Sciences
Department of Mathematics

Midterm Exam-2

Math 106

November 2025

Question 1 : (3+3+3)

- a) Find $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right)$.
- b) Use $u = x^2$ and integrate by parts to find $\int x^5 e^{x^2} dx$.
- c) Compute $\int \sin^4(2x) dx$.

Question 2 : (3+3+3)

- a) Evaluate $\int \sec^3 x \tan^5 x dx$.
- b) Find the indefinite integral $\int \frac{dx}{(x^2 + 2x + 2)^2}$.
- c) Compute $\int \frac{x^2 - x + 6}{x^3 + 3x} dx$.

Question 3 : (3+2+2)

- a) Evaluate $\int \frac{xdx}{(1+x^2) + \sqrt{1+x^2}}$.
- b) Find $\int \frac{dx}{1 + \cos x + 6 \sin x}$.
- c) Does the integral $\int_0^{+\infty} \frac{e^x}{(1+5e^x)^2} dx$ converge? Find its value if it does.