

King Fahd University of Petroleum and Minerals  
Department of Mathematical Sciences  
**MATH 102 (Section 1)**  
Final Exam  
Semester I, 2004–2005(041)  
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Q1. Evaluate the following integrals:

(a)  $\int_{-1}^1 \frac{dx}{\sqrt[3]{x}}$ .

(b)  $\int \ln^2 x \, dx$ .

Q2. Evaluate the integral

$$\int \frac{2x^2 + x + 17}{(x - 1)(x^2 + 2x - 3)} dx.$$

Q3. Find the area of the region outside the curve  $y = x^2$  and between the lines  $y = 2x - 1$  and  $y = x + 2$ .

Q4. Find interval of convergence for power series  $\sum_{n=2}^{\infty} \frac{(x+5)^n}{2^n \ln n}$ .

Q5. (a) Test for convergence  $\sum_{n=1}^{\infty} \frac{1}{3\sqrt{n(n+3)}}.$

(b) Test for absolute convergence, conditional convergence or divergence

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1} \sqrt[3]{n}}{n+1}.$$

Q6. (a) Use a known Maclaurin series to find the Maclaurin series for  $f(x) = x^2 \cosh x$  and express the series in sigma notation.

(b) State the radius of convergence of series in part (a) and give reasons.

Q7. (a) Evaluate  $\int_{\pi/4}^{\pi/2} \csc^4 x \, dx$ .

(b) Test of convergence  $\sum_{n=1}^{\infty} \frac{1}{1 + \ln n}$ .