

King Fahd Univ. of Petroleum and Minerals  
Faculty of Sciences  
Department of Mathematical Sciences

MAJOR No. 2  
(MATH. 102-051 Section 4)

**Name:**

**ID:**

**Important instructions:**

- Use an HB pencil or a pen (do not use red color)
- Solve the problems completely
- Write down your answers in a clear manner
- Justify all your steps
- Use the back of the page (verso) only for scratching

**Prob. 1**

Find the volume of the solid that results when the region enclosed by  $y = \cos x$ ,  $y = \sin x$  and  $x = 0$  is revolved about the  $x$ -axis

**Prob. 2**

Find the volume of the solid that results when the region enclosed by  $y = \sqrt{\frac{1-x^2}{x^2}}$  ( $x > 0$ ),  $x = 0$ ,  $y = 0$ ,  $y = 2$  is revolved about the  $y$ -axis.

**Prob. 3**

Use cylindrical shells to find the volume of the solid generated when the region enclosed by  $xy = 4$ ,  $x + y = 5$  is revolved about the  $x$ -axis.

**Prob. 4**

Find the exact arc length of  $y = \frac{x^6+8}{16x^2}$  from  $x = 2$  to  $x = 3$ .

**Prob. 5**

Find the integrals

(a)  $\int \frac{dx}{x^2\sqrt{x^2+25}}$

(b)  $\int \frac{\cos x dx}{\sqrt{2-\sin^2 x}}$

**Prob. 6**

Find

(a)  $\int \csc^2 v \cot^4 v dv$

(b)  $\int \cos(\ln t) dt$

**Prob. 7**

Compute

(a)  $\int_0^2 \ln(u^2 + 1) du$

(b)  $\int \frac{e^{-y}}{4 - e^{-2y}} dy$



**Prob. 8**

Write down the right decomposition for

$$\int \frac{15x^6 - 3x^4 + 8x^3 + 8}{(x-1)x^3(x+2)^2(x-3)(x^2+x+3)(2x^2-3x+1)^2} dx$$

and compute the integrals of the simple elements involved in the decomposition.