

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

FINAL EXAM
(MATH. 260-053 Sections 2 and 3)

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 a general solution for

$$(t^2 + 1)dx = t \cot x dt$$

Prob. 2

Solve

$$\frac{dz}{dy} = 1 + y + z + yz, \quad z(0) = 0$$

Prob. 3

Solve

$$(1 + 2xy) \frac{dy}{dx} = 1 + y^2$$

Prob. 4

Solve

$$(e^u \sin v + \tan v)du + (e^u \cos v + \sec^2 v)dv = 0$$

Prob. 5

Is

$$E = \{(x_1, x_2, x_3, x_4) : x_1 = 3x_3 \text{ and } x_2 = 4x_4\}$$

subspace of R^4 ? Justify your answer!

Prob. 6

The vectors $\{v_1, v_2, v_3\}$ are known to be linearly independent. Prove that

$$u_1 = v_1$$

$$u_2 = v_1 + 2v_2$$

$$u_3 = v_1 + 2v_2 + 3v_3$$

are also linearly independent.

Prob. 7

Set up the appropriate form of a particular solution y_p , but do not determine the values of the coefficients

a) $y^{(3)} - y'' - 12y' = x - 2xe^{-3x}$

b) $y^{(4)} + 5y'' + 4y = \sin x + 2 \cos 2x$

Prob. 8

Use the method of variation of parameters to solve

$$y'' + y = \csc^2 x.$$

Prob. 9

Is

$$A = \begin{pmatrix} 3 & -2 & 0 \\ 0 & 1 & 0 \\ -4 & 4 & 1 \end{pmatrix}$$

diagonalizable? If it is, find P and D .

Prob. 10

Solve by the eigenvalue method

$$\begin{cases} x_1' = 5x_1 + 5x_2 + 2x_3 \\ x_2' = -6x_1 - 6x_2 - 5x_3 \\ x_3' = 6x_1 + 6x_2 + 5x_3. \end{cases}$$