King Fahd University of Petroleum & Minerals

Department of Mathematics & Statistics
2015-2016 (Term 153)
Introduction to Differential Equations & Linear Algebra
(MATH 260)
Exam I

Student Name:	**Section #:**
ID #:	**Serial #:**

Instructions

1. Justify your answers. No credit is given for (correct) answers not supported by work.
2. Write clearly. Marks may be deducted for messy work.

Question	Marks	Out of
1		12
2		10
3		12
4		12
5		12
6		12
7		12
8		8
Total		90

1. Solve the IVP: $(x^2+1)(\cot y)\,y' = x;\ y(0) = \pi/2$.

2. A certain culture of bacteria increases at a rate proportional to the number of bacteria present at time t. After 6 hours the number of bacteria is 9 times the initial population. How long did it take the population to double?

3. Find the general solution of the DE: $\frac{y'}{3} + y = x^2 e^{-3x}$.

4. Solve the DE: $(e^x + y)\,dx + (2 + x + ye^y)\,dy = 0$.

5. Solve the DE: $(x^2 + xy)\,\dfrac{dy}{dx} = y^2$.

6. Use a suitable substitution to solve the DE: $xy'' = y'$.

7. Use Gaussian elimination to determine the value(s) of the constant k for which the system

$$\begin{aligned} x + 2y + z &= 3 \\ 3x + y - 2z &= 8 \\ 5x + 5y &= k \end{aligned}$$

has:

(a) no solution;

(b) a unique solution;

(c) infinitely many solutions.

8. Use elementary row operations to find the reduced row echelon form of the matrix

$$A = \begin{bmatrix} 9 & 4 & -7 & 5 \\ 5 & 2 & -5 & 0 \\ 4 & 1 & -7 & 0 \end{bmatrix}$$