Department of Mathematics
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Course Code: EMAT102L **Course Name: Linear Algebra & ODEs**
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	CO1	CO2	CO3	CO4	CO5
Q1					✓
Q2					✓
Q3					✓
Q4					✓
Q5					✓

Tutorial Sheet 1

1) Solve the following exact/reducible to exact ODEs:

   (a) $2xye^{x^2}dx + e^{x^2}dy = 0, \quad y(0) = 2;$
   (b) $\cos(x+y)dx + (3y^2 + 2y + \cos(x+y))dy = 0;$
   (c) $(1+2x)\cos y dx + \sec y dy = 0;$
   (d) $3x^2ydx + 4x^3dy = 0.$

   Hint: (a) $y = 2e^{-x^2}$, (b) $\sin(x+y) + y^3 + y^2 = c$, (c) $\tan y = -x - x^2 + c.$

2) Solve the following linear/reducible to linear ODEs:

   (a) $\dfrac{dy}{dx} + 3x^2y = x^2,\ y(0) = 2;$
   (b) $y^2dx + (3xy - 1)dy = 0;$
   (c) $\dfrac{dy}{dx} + y = f(x),\ y(0) = 0,$ where $f(x) = \begin{cases} 2 & 0 \le x < 1, \\ 0 & x \ge 1. \end{cases}$,
   (d) $dy + (4y - 8y^{-3})xdx = 0.$

3) Under what conditions for the constants a, b, k, l, is $(ax+by)dx + (kx+ly)dy = 0$ exact? Solve the exact ODE.

4) Does the IVP $(x-2)\frac{dy}{dx} = y;\ y(2) = 1$ have a solution? Justify your answer.

5) Show that existence and uniqueness theorem guarantees the existence of a unique solution of the IVP-

   (a) $\dfrac{dy}{dx} = e^{2y};\ y(0) = 0.$
   (b) $\dfrac{dy}{dx} = y^{4/3};\ y(x_0) = y_0.$