For comments, corrections, etc...Please contact Ahnaf Abbas: <u>ahnaf@uaemath.com</u> This is an open source document. Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, <u>http://www.gnu.org/copyleft/fdl.html</u> Version 1.2 or any later version published by the Free Software Foundation.

International Institute for Technology and Management



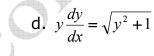
November 28th,2005

Tutoring Sheet #6

Unit 76: Management Mathematics –Differential Equations

- 1. Solve the following Differential Equations:
 - a. $y'' = xe^x$
 - c. (2x + 3y)dx + (y x)dy = 0

e.
$$x^3 dx + (y+1)^2 dy = 0$$



f.
$$\frac{dy}{dx} = \frac{y(x+2y)}{x(2x+y)}$$

b. $2\sqrt{x}\frac{dy}{dx} = x^2 - 1$

- 2. Solve the following differential equations:
 - a. $\frac{dy}{dx} + 2y = 8x^2 2$ b. $x\frac{dy}{dx} + 3y = 2x + 5$ c. $x^2 \frac{dy}{dx} + xy + y = 0$ e. $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 3x^2 + x + 2$ If y = 1 and $\frac{dy}{dx} = 1$ when x = 0f. $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = e^{2x}$ g. $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - y = \sin x$ h. $\frac{d^2y}{dx^2} + y = \sin x + \cos x$ i. $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = e^{2x} \cos x$ j. $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 8(x^2 + \sin 2x)$ k. $\frac{d^2y}{dx^2} + 4y = \cos 2x + \cos 4x$

http://www.mathyards.com/lse

For comments, corrections, etc...Please contact Ahnaf Abbas: <u>ahnaf@uaemath.com</u> This is an open source document. Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, <u>http://www.gnu.org/copyleft/fdl.html</u> Version 1.2 or any later version published by the Free Software Foundation.

LSE Previous Papers

3. Suppose the consumer demand for a company's only product line depends upon the price according to the following formula:

q = 50 - 40 p - 7
$$\frac{dp}{dt} + \frac{d^2p}{dt^2}$$

and the supply function q = -10 + 20p

i) Determine the equilibrium price and quantity if p = 5

and
$$\frac{dp}{dt} = 31$$
 when $t = 0$.

- ii) Produce a sketch graph of p against t and describe the behavior of p .
- iii) Suggest how the above model might be used in practice Do you foresee any limitations on its use. (LSE 2003)
- 4. You are given the following differential equation in y :

$$\frac{d^2 y}{dx^2} - 7 \frac{dy}{dx} + 12y = x e^{3x}$$

If y = 1 and $\frac{dy}{dx} = 3$ when x = 0

Solve the above differential equation of y , graph the solution And describe the graph in words.

(LSE 2004)

5. A company maintains its machines every t days and discovers that the overall maintenance costs of the machines, C , are related to t by the following differential equation:

$$t^2 \frac{dC}{dt} - (b - 1)tC = -ab$$

where a and b are constants and $C = C_0$ when $t = t_0$

- i) Derive C as a function of t and the other given constants.
- ii) Graph C against t for the case a = 4, b = 2, $C_0 = 10$ and $t_0 = 1$ (LSE 2005)