



Al-Mustaqbal University College

Department of Medical Instrumentation Technologies

Mathematics II / Second Stage

By

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Differential Equations

First order differential equations of first degree:

$$(3) - x \frac{dy}{dx} + 3y = \frac{5inx}{x^2} \quad \div x$$

$$\frac{dy}{dx} + \frac{3}{x}y = \frac{5inx}{x^3} \quad linear D.E$$

$$P = \frac{3}{x}, \quad Q = \frac{5inx}{x^3}$$

$$\varphi = e^{\frac{3}{x}} \quad A = \frac{5inx}{x^3} \quad A = \frac{5inx}{x^3}$$

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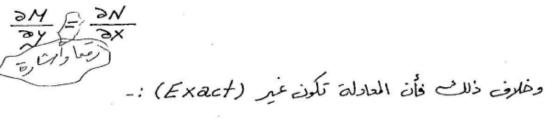
$$\varphi = e^{\frac{3}{x}} \quad A = \frac{5inx}{x^3} \quad A = \frac{5inx}{x^3}$$

HW

 $(zy + x^2) dx = x dy$

M(X2y) dx + N(X2y) dy =0 ____ aluan auan

أن هذه المعادلة تكون (Exact) اذا كان :-



بعد أختبار العادلة وكانت (Exact) فنكون العل كالريق:-

SM(x,y) dx + SN(x,y) dy = So = c ك الا يعبر كاب ولاحظة حجدة :- قبل أحراد التكامل اعلره يجب ان نعوض في الحدالثان (yb(y,x))) بول كل (x) ب (a) لم بخر 451

Show that the following equations are exact and solve each one :-()_ (2x+3y-2) dx + (3x-4y+1) dy =0 $M = 2x + 3y - 2 \implies \frac{\partial M}{\partial y} = 3$ $N = 3x + 4y - 1 \implies \frac{\partial M}{\partial x} = 3$: JM = JN = 3 Exact SNdx + SNdy = c $\int_{a}^{x} (2x+3y-2) dx + \int (3a-4y+1) dy = c$ $\begin{bmatrix} x^2 + 3yx - 2x \end{bmatrix}^X + \begin{bmatrix} 3ay - 2y^2 + y \end{bmatrix}^y = c$ $\left[(x^{2}+3yx-2x)-(a^{2}+3ya-2a)\right]+\left[(3ay-2y^{2}+y)-(3ab-2b^{2}+b)\right]=c$ x2+3yx-2x-22-3y2+22+32y-2y2+y-326+26+6=c $x^{2} + 3yx - 2x - 2y^{2} + y = c + a^{2} - 2a + 3ab - 2b^{2} - b$: x2+3y-2x-2y+y=k

HW $(y^2 - 1) dx + (z \times y - Siny) dy = 0$

Integration Factor

في حالت أجبتبار العادلة التغاضلية المعطاة بطريقة (Act) وكانت (<u>N</u>E = <u>M</u>E) فأن المعادلة تحل لطريقة ال (xact). (NE = VR) فأن المعادلة تحل الطريقة ال (tract). أما اذا كانة (<u>N</u>E + VR) فأن المعادلة هي ليست (tract). وهنا يجب تدقيق هل لعادلكة (shinear, Homog, variable).

فأذا كانت جميع هذه المرق عنر مناسبة لحل هذه المعادلة خايب ان تغرب هذه المعادلة عمال يسمئ (Integration Factor) تكي تتولى المعادلة الى (Exact) .

ولغرض أمجاد (I.F) يم ذلك بطريقتين أنيها أسهل تستعمل في
الحل:
$$\int F(x) dx$$

 $I.F = C$

where:
$$F(x) = \frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N}$$

$$= \frac{\partial M}{\partial x} = \frac{\partial M}{\partial x}$$

$$\underbrace{F_{X,i}}_{X} = (x^{2} + y^{2} + x) dx + xy dy = 0$$

$$\underbrace{M = x^{2} + y^{2} + x}_{\partial X} \implies \underbrace{\partial M}_{\partial y} = 2y$$

$$\underbrace{M = xy}_{X = y} \implies \underbrace{\partial M}_{\partial x} = y$$

$$\underbrace{\partial M}_{\partial y} \neq \underbrace{\partial N}_{\partial x} \implies The eq. is not exact.$$

$$ue must Find I.F$$

$$\begin{aligned}
F(x) = \frac{\partial M}{\partial y} - \frac{\partial M}{\partial x} = \frac{2y - y}{xy} = \frac{x}{xy} = \frac{1}{x}$$

$$I:F = e^{-x} = e^{-x} = e^{-x}$$

$$\therefore (x^{2} + y^{2} + x) dx + xy dy = 0 \quad \times I.F = x$$

$$(x^{3} + xy^{2} + x^{2}) dx + x^{2}y dy = 0$$

$$\underbrace{M = x^{3} + xy^{2} + x^{2} dx}_{\partial x} = \frac{\partial M}{2x} = 2xy$$

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