Math (3) :-

* $y = x^2 + 4$ find $\frac{dy}{dx} = 2x$ O.DE معادلة تفاضلية عادية

If $z = x^2 + y^2$ $\frac{dz}{dx} = 2x$ $\frac{dz}{dy} = 2y$ P.DE

① → classification of DE :-

① Type of DE :- → ODE معادلة تفاضلية
→ P.DE → ⑥ أكثر من متغير

② order of DE → رتبة المعادلة التفاضلية (أعلى مشتقة)

$y''^{4} + 2xy' + y = x$ order = 2 , degree = 4

③ degree of DE أس أعلى مشتقة

④ $a_n \frac{d^n y}{dx^n} + a_{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + a_2 \frac{d^2 y}{dx^2} + a_1 \frac{dy}{dx} + a_0 y = f(x)$

① y وجميع المشتقات يساوي ①
② $a_n, \dots, a_1$ ثوابت او دوال في x فقط
$e^x, e^y, \tan, \sin, \cos$ → non
$* y \frac{dy}{dx} *$

Linear ← ما غير ذلك non

* $y''' + 2x y'' + \sin(x) y' + x^2 y = 0x$
$-x = 0$

① ODE   ② order = 3   ③ degree = ①

④ Linear   ⑤ ~~Homo~~ Non Homo   ⑥ linear in (x)

$\frac{dy}{dx}$ → linear (x)

لازم ما لا يوجد y

2) $\frac{d^2y}{dx^2} + 2x^2\frac{dy}{dx} + \sin(x)\,y = 0$

① ODE ② or = 2 ③ deg = 1 ④ linear

⑤ Homo ⑥ linear in x

③ $y'''' + (y''')^2 + 2x\,y''' + x^2 y'' + \ln(x)\,y = 0$

① ODE 2) order = 4 3) degree = 2

4 nonlinear ~~5 Homo~~ 6

* $\sin(x^n) \neq \sin^n(x)$
* $\sin^n(x) = (\sin(x))^n$
* $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$
* $\sqrt{-1} = i$
* $\ln(\frac{x}{y}) = \ln(x) - \ln(y)$
* $e^{\alpha \ln x} = x^{\alpha}$
* $\ln(a+b) \neq \ln(a) + \ln(b)$
* $\frac{a}{b+c} \neq \frac{a}{b} + \frac{a}{c}$
* $x^m \cdot x^n = x^{m+n}$
* $\frac{x^m}{x^n} = x^{m-n}$
* $\ln(xy) = \ln(x) + \ln(y)$
* $\ln x^{\alpha} = \alpha \ln x$
* $e^{\ln f(x)} = f(x) = \ln(e^{f(x)})$

* $e^0 = 1$ $e^{\infty} = \infty$ $e^{-\infty} = 0$

$\ln e = 1$ $\ln \infty = \infty$ $\ln(1) = 0$ $\ln(-\infty) = -\infty$

$\sin(0) = 0$ $\cos(0) = 1$ $\sin(90) = 1$ $\cos(90) = 0$

$\tan(\frac{\pi}{2}) = \infty$

* $x^2 - a^2 = (x-a)(x+a)$

* $\sqrt[m]{x^n} = x^{n/m}$

* $(x+a)^2 = x^2 + a^2 + 2xa$

*

* $e^a \cdot e^b = e^{a+b}$

* $ax^2 + bx + c = 0$

$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

* $x^2 + 3x + 2 = 0$

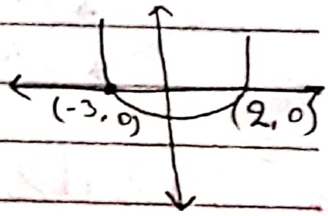
$(x+1)(x+2) = 0$ → factor حلول

$x_1 = -1$ $x_2 = -2$

↓

roots جذور

نقط التقاطع مع محور (x)



→ $x_1 = -3$ $x_2 = 2$

→ $(x+3)(x-2) = 0$

* $\int x^n dx = \frac{x^{n+1}}{n+1} + c$ SiT $n \neq -1$

* $\int \frac{1}{x} dx = \ln(x) + c$

* $\int \frac{f'(x)}{f(x)} d(x) = \ln(f(x)) + c$

* $\int \frac{1}{x+1} dx = \ln(x+1) + c$

* $\int e^{ax+b} dx = \frac{1}{a} e^{ax+b} + c$

* $\int e^{f(x)} \cdot f'(x) = e^{f(x)} + c$

* $\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \tan^{-1}(x/a) + c$

$$\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}\left(\frac{x}{a}\right)+C$$

$$\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a}\sec\left(\frac{x}{a}\right)+C$$

$$\int (f(x))^n f'(x)\,dx = \frac{1}{n+1}(f(x))^{n+1}$$

* $\int x^2 e^x dx = x^2e^x - 2xe^x + 2e^x + C$

D	I
$+\ x^2$	e^x
$-\ 2x$	e^x
$+\ 2$	e^x
$-\ 0$	e^x

* $\int \ln x\,dx = x\ln x - \int x\cdot\frac{1}{x}dx$

$= -\int dx$

$= -x + C$

D	I
$\ln x$	1
$\frac{1}{x}$	x

* $\int \sin^2 x\,dx = \frac{1}{2}\int[1-\cos 2x]\,dx$

$= \frac{1}{2}\left[x - \frac{(\sin 2x)}{2}\right]+C$

* $\frac{dy}{dx} = 1+y^2$ $\qquad \int \frac{dy}{1+y^2} = \int dx$

$\tan^{-1}(y) = x+C$

$y = \tan(x+C)$