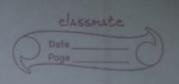
First Order homogeneous equation?

A first order differential equation y'=f(x,y) is said to a homogeneous equation if f(x,y) is a homogeneous function of degree of homogenity 0.

Ex: y'= 22+y2 -> Homogeneous diff. eq. $f(x,y) = \frac{x^2+y^2}{xy} = \frac{x^2(1+(\frac{y}{x})^2)}{x^2} = f(\frac{y}{x})$

g'= 22+2y+g2 -> not a homogeneous diff. eq.



Process for Solving homogeneous differential equation:

- · Consider the variable transformation, y=vx then dy = v + x dv
- · Substitute the values of y and dy in terms of x and & in the given equation.
- · Use variable seperation method for solving the problem and finally substitute v= 4 in the obtained solution.

or,
$$\frac{dy}{dx} = \frac{x^2 + 4y^2 + xy}{x^2} = 1 + 4(\frac{y}{x})^2 + (\frac{y}{x})$$

or,
$$\frac{dv}{1+4v^2} = \frac{dx}{x}$$

$$\int \frac{da}{1+\alpha^2} = den^{-1} \propto$$

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

or,
$$\int \frac{dv}{1+4v^2} = \int \frac{dx}{x}$$

or,
$$\frac{1}{4} \int \frac{dv}{1/4 + v^2} = \int \frac{dx}{x}$$

or,
$$\frac{1}{4} \cdot \frac{1}{\sqrt{2}} \cdot \tan^{-1}\left(\frac{U}{1/2}\right) = \ln x + C$$

$$\Rightarrow \frac{1}{2} \tan \left(\frac{2y}{x}\right) = \ln x + c.$$

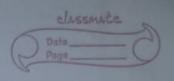
 $y' = \left(\frac{4x+y}{x^2}\right)^2$ Question

$$\Rightarrow \frac{dy}{dx} = \frac{(4x+y)^2}{x^2}$$

or,
$$2 \frac{du}{dx} = 16 + u^2 + 7u$$

or,
$$\int \frac{dv}{16 + v^2 + 7v} = \int \frac{dx}{x}$$

or,
$$\int \frac{dv}{v^2 + 2 \cdot \frac{7}{2} \cdot v + (\frac{7}{2})^2 + 16 - (\frac{7}{2})^2} = \ln x + c$$



or,
$$\int \frac{dv}{(v + \frac{7}{2})^2 + (\frac{\sqrt{15}}{2})^2} = \ln x + c$$

or,
$$\frac{2}{\sqrt{15}} \tan^{-1} \left(\frac{2\nu + 7}{\sqrt{15}} \right) = \ln \alpha + c$$

or,
$$\frac{2}{\sqrt{15}} + \frac{1}{\sqrt{15}} \left(\frac{2(\sqrt{1/x})}{\sqrt{15}} + 7 \right) = \ln x + c$$
 or, $\frac{2}{\sqrt{15}} + \frac{1}{\sqrt{15}} + \frac{1}{\sqrt{15}} + c$

5.
$$3xy' - 3y + \sqrt{x^2 + y^2} = 0$$

HW

or,
$$\propto \frac{dv}{dx} = -\frac{(3v+v^2)}{1+v} - \sqrt{3v+v^2} + \sqrt{(1+v)}$$

$$= - (4v + 2v^2) = - (2+v) 2v$$

$$1+v$$

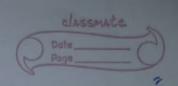
$$1+v$$

or,
$$\frac{1+v(dv)}{2v(2+v)} - \frac{1}{2} dx$$

or,
$$\int \frac{1}{2v(2+v)} dv + \int \frac{1}{2(2+v)} dv = -\ln \alpha + C$$

or,
$$\left[\frac{1}{4v} - \frac{1}{4(2+v)}\right] dv + \frac{1}{2} ln(v+2) = -ln x + c$$

04,
$$\frac{1}{4} \left[\ln v - \ln (v+2) + 2 \ln (v+2) \right] = -\ln x + c$$



or, $\frac{1}{4}\left[\ln v + \ln \left(v+2\right)\right] = -\ln x + C$

or, $\ln v(v+2) = -\ln x + C$.

: V= 8/2

 $\frac{1}{4}\ln\left(\frac{y^2+2\alpha y}{\alpha^2}\right) = -\ln\alpha + C$

guestion: 2y' = 2e-8/2y

or, $y' = e^{-y/x} + y$

let, y= vx : y'= v+ x dv ...

: V+ x dv = e-v + v) = ad = (115) 02 00

or, a dv = 1

or, $e^{\nu} d\nu = \frac{1}{2} d\alpha$

or, $\int e^{\nu} d\nu = \int \frac{1}{2} d\alpha$

Let. y= va : y'= v+ a du

or, er = ln x + C for + = 0 who to

or, eyh = lnx+C

(20 to 120 de 10 12)

Ex 8- 2/2 - 2/2 - 2/2

Generalis : 224- my = 220 y 2

guestion:
$$xy' = y + x sec(3/x)$$

or,
$$\frac{1}{8ecv} dv = \frac{1}{\pi} dx$$

or,
$$\int \cos v \, dv = \int \frac{1}{2} \, d\alpha$$

or,
$$y' - y/x = \frac{x^2 + y^2}{x^2}$$

$$\therefore \forall + \alpha \frac{dv}{d\alpha} - \vartheta = \frac{\alpha^2 + (\vartheta \alpha)^2}{\alpha^2}$$

or,
$$\alpha dv = \alpha^2 (1+y^2)$$

1 = ac 200 1

R + x/R-3 -1 / 300

on [endu] ado

or,
$$\frac{1}{1+v^2} dv = \frac{1}{x} dx$$

or,
$$\int \frac{1}{1+v^2} dv = \int \frac{1}{2} dx$$

or,
$$y' = \frac{y}{x} - \frac{1}{3} \int_{1}^{1} (\frac{y}{x})^2 + \frac{1}{3} \int$$

or,
$$2 \frac{dv}{dx} = -\frac{1}{3}\sqrt{1+v^2}$$

or,
$$\frac{dv}{\sqrt{1+v^2}} = -\frac{1}{3} \frac{dn}{\alpha}$$

or,
$$(v + \sqrt{1 + v^2})^3 = C^3/\alpha$$

or,
$$y + \sqrt{x^2 + y^2} \le K/\alpha$$

$$\int \frac{dx}{\sqrt{a^2 + x^2}} = \frac{1}{a} \ln |x + \sqrt{a^2 + x^2}|$$

$$=\frac{1}{a}\ln\left|\chi+\sqrt{a^2+\chi^2}\right|$$