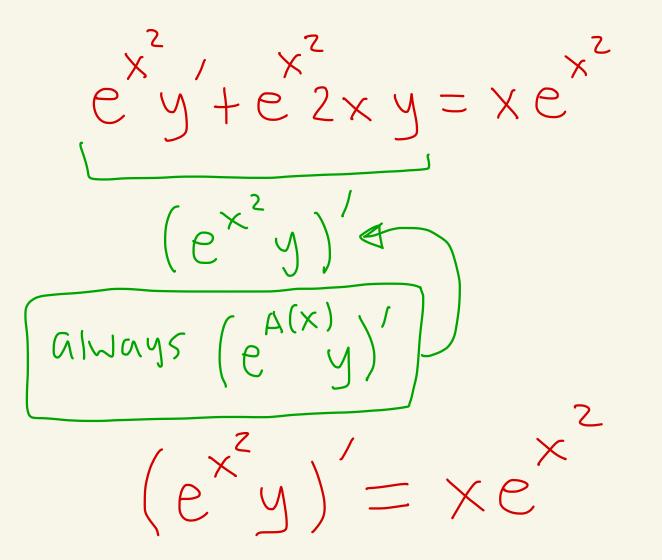


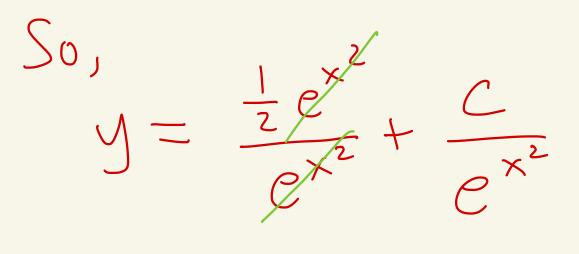
Practice Test 2 (HW I \ | [(e)]  $\frac{dy}{dx^2} + \frac{yx^3}{dx} + \frac{dy}{dx} + \frac{x^2y}{dx} = 0$ UDE order 2 not linear -[HW3] (Practice Test 1] (b) Solve linear equation y' + 2xy = X

 $\cup \cap \mathbb{T} = (-\infty,\infty)$ 

 $A(x) = \int 2x \, dx = 2\frac{x^2}{2} = x^2$ Multiply y+2xy=x by  $e^{A(x)} = e^{x^2} + o get$ 



Integrate: xerdx X' y =6,  $\int xe^{x^2} dx = \frac{1}{z} \int e^{y} dy$ = N y = 5x qxy = x qx $\frac{1}{2}e^{+}C$  $\frac{1}{2}e^{+}t$ We get  $e^{\chi} q = \frac{1}{2}$ 



Thus,

$$y = \frac{1}{z} + Ce^{-x^2}$$

HW4  
((h)) Solve the separable  
problem:  

$$Xy' = 4y$$
,  $y(1) = 5$ 

 $\times \gamma' = 4 \gamma$  $\times \frac{dy}{dx} = 4y$  $\frac{1}{y}dy = \frac{4}{x}dx$  $\int \frac{1}{y} dy = \int \frac{4}{x} dx$  $\left[n\left|y\right|=4\left[n\left|x\right|+C\right]$  $e^{\ln|y|} = e^{\ln|x|+c}$  $|y| = e \cdot e$  $|y| = (e^{\ln|x|})^4 \cdot e^{c}$  $|y| = |x|^4 \cdot e^{-2}$  $|\chi|^{4}$ 

$$|y| = e^{c} \times 4 \qquad = |x^{4}| = x^{4}$$

$$y = \pm e^{c} \times 4$$

$$y = A \times 4 \quad \text{where A is}$$

$$\alpha \text{ constant}$$

Let's make our solution Satisfy y(1) = 5. We need: x = 1y = 5 $y = Ax^{T}$ x = 1y = 5 $5 = A(1)^4 \leftarrow$  $S_0, A=5$ Thus,  $y = 5x^{4}$ 

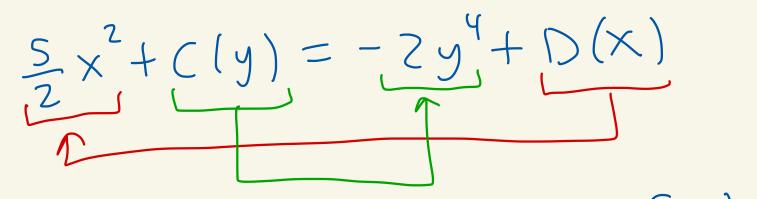
WS  $\left( b \right)$ Consider  $(5x+4y)+(4x-8y^{3})y=0$ Check that it's exact M = 5x + 4yCuntin- $N = 4X - 8y^3$ 1202 luery- $\partial M = 5$ where JX -24y2 DN = 29  $=\frac{33}{9V}$ heck:

So it's exact. Need f(x,y) where  $\frac{\partial f}{\partial x} = 5 \times + 4 \text{ y} \quad (1) \quad \left( \frac{\partial f}{\partial x} = M \right)$   $\frac{\partial f}{\partial y} = 4 \times - 8 \text{ y}^{3} \quad (2) \quad \left( \frac{\partial f}{\partial x} = M \right)$ Integrate () with respect to x:  $f(x,y) = \frac{5}{2}x^{2} + 4xy + C(y)$ constant w/ respect to x Integrate 2 with respect to y:  $f(x,y) = 4xy - 2y^{4} + D(x)$ 

Constant with respect to y

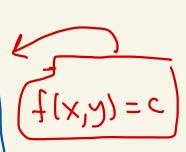
Set equal:

 $\frac{5}{2}x^{2} + 4xy + C(y) = 4xy - 2y^{4} + D(x)$ 



Set  $((y) = -2y^{4}, D(x) = \frac{5}{2}x^{2}$ Plug ((y) into above:  $f(x,y) = \frac{5}{2}x^{2} + 4xy + C(y)$  $f(x_1y) = \frac{5}{2}x^2 + 4xy - 2y^4$ 

Answer  $S_{2}x^{2}+4xy-2y^{4}=c$ Where c is any constant Answer



HW7 Solve y'' + 9y = 0 $r^{+}9=0$  $r = \frac{-0 \pm \sqrt{0^2 - 4(1)(9)}}{\sqrt{0}}$ Z(1) $\frac{\pm\sqrt{-36}}{2} = \pm\sqrt{36\sqrt{-1}}$  $=\pm\frac{6i}{2}=\pm3i$ = 0±3% X ± Bi x = 0 B = 3

$$y_{h} = c_{1} \underbrace{e^{ox} \cos(3x) + c_{2} \underbrace{e^{ox} \sin(3x)}_{e^{x} \cos(\beta x)} + c_{2} \underbrace{e^{ox} \sin(\beta x)}_{e^{x} \sin(\beta x)}$$

$$Use \ e^{0x} = e^{0} = 1$$

$$y_{h} = c_{1} \cos(3x) + c_{2} \sin(3x)$$

Hwb  

$$Z(c)$$
 Suppose you know  
that  $y_h = c_1 x^2 + c_2 x^4$   
for  $x^2 y'' - 5x y' + 8y = D$   
and  $y_p = 3$  for

 $x^{2}y'' = 5xy' + 8y = 24$ What's the general Solution to  $x^{2}y''_{-} 5xy'_{+}8y = 24$ 

Answer:  $(y = y_h + y_f = c_1 x^2 + c_2 x^4 + 3)$