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Dis 2A

SECTION 2.6

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$$\frac{\partial(In(xy)+x^2y^3)}{\partial x}$$

$$\Rightarrow (\frac{1}{x}+2xy^3)dx$$

$$\frac{\partial(In(xy)+x^2y^3)}{\partial y}$$

$$\Rightarrow (\frac{1}{y}+3x^2y^2)dy$$

$$dF=(\frac{1}{x}+2xy^3)dx+(\frac{1}{y}+3x^2y^2)dy$$

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$$\frac{\partial(tan^{-1}(\frac{x}{y})+y^4)}{\partial x}$$

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

$$\frac{\partial(tan^{-1}(\frac{x}{y})+y^4)}{\partial y}$$

$$\Rightarrow (-\frac{x}{x^2+y^2}+4y^3)dy$$

$$dF=(\frac{y}{x^2+y^2})dx+(-\frac{x}{x^2+y^2}+4y^3)dy$$

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$$\phi(u,v)=\int \frac{2u}{u^2+v^2}du+g(v)$$

$$=In|v^2+u^2|+g(v)$$

$$\frac{\partial\phi}{\partial v}=\frac{2v}{v^2+u^2}+g'(v)$$

$$\Rightarrow g'(v)=0\Rightarrow g(v)=C$$

$$\phi(u,v)=In|v^2+u^2|+C$$

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$$\frac{(3y+y)(y+1)}{x^4}dx+\frac{-2(y+1)}{x^3}dy$$

$$\phi(x,y)=\int \frac{(3y+y)(y+1)}{x^4}dx+g(y)=-\frac{4y(1+y)}{3x^3}+g(y)$$

$$\frac{\partial\phi}{\partial y}=\frac{4+8y}{3x^3}+g'(y)=\frac{-2(y+1)}{x^3}$$

$$g'(y)=\int(-\frac{2(y+1)}{x^3}-\frac{4+8y}{3x^3})dy$$

$$g(y)=-\frac{2(\frac{7y^2}{2}+5y)}{3x^3}$$

$$\phi(x,y)=-\frac{2(\frac{7y^2}{2}+5y)}{3x^3}-\frac{4y(1+y)}{3x^3}$$

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$$M=y^2+2xy, N=-x^2$$

$$\frac{\partial M}{\partial y}=2y+2x, \frac{\partial N}{\partial x}=-2x$$

$$\mu=e^{-\int\frac{2(2x+y)}{y(2x+y)}dx}$$

$$=e^{-2Iny}=\frac{1}{y^2}$$

$$(1+\frac{2x}{y})dx-\frac{x^2}{y^2}dy=0$$

$$F(x,y)=\frac{xy+x^2}{y}=C$$

$$\mu(y)=\frac{1}{y^2}$$

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$$y = vx, \frac{dy}{dx} = v + \frac{dv}{dx}$$

$$\Rightarrow v + x\frac{dv}{dx} = \frac{v + v^3}{v^2 - 2}$$

$$x\frac{dv}{dx} = \frac{3v}{v^2 - 2}$$

$$\int (\frac{v^2 - 2}{3v})dv = \int \frac{dx}{x}$$

$$\Rightarrow \frac{v^2}{6} - \frac{2}{3}In(v) = In(x) + In(C)$$

$$y^{\frac{2}{3}} = Cx^{-\frac{1}{3}}e^{\frac{y^2}{6x^2}}$$