Name: Chen Chen
UID: 004710308
Dis 2A

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$$\frac{\partial F(x,y)}{\partial x} = x(x^2+y^2)^{-\frac{3}{2}}dx$$

$$\frac{\partial F(x,y)}{\partial x} = y(x^2+y^2)^{-\frac{3}{2}}dy$$

$$F'(x,y) = x(x^2+y^2)^{-\frac{3}{2}}dx + y(x^2+y^2)^{-\frac{3}{2}}dy$$

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

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

$$\emptyset(x,y) = \int(\frac{1}{x}+\frac{1}{y})dx + g(y)$$

$$\Rightarrow \emptyset(x,y) = -\frac{x}{y} + In|x| + g(y)$$

$$\frac{\partial\emptyset}{\partial y} = \frac{x}{y^2} + g'(y) = \frac{x}{y^2}$$

$$g(y) = C$$

$$\emptyset(x,y) = -\frac{x}{y} + In|x| + C$$

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Let $M = y$ and $N = (x^2y - x)$

$$\frac{\partial M}{\partial y} = 1, \frac{\partial N}{\partial x} = 2xy - 1$$

$$\frac{1}{N}(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}) = -\frac{2}{x}$$

$$\Rightarrow I = \int -\frac{2}{x}dx = \frac{1}{x^2}$$

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

$$\emptyset(x,y) = \int\frac{y}{x^2}dx + g(y) = -\frac{y}{x} + g(y)$$

$$\frac{\partial\emptyset}{\partial x} = -\frac{1}{x} + g'(y) = \frac{xy-1}{x}$$

$$\Rightarrow g'(y) = y, g(y) = \frac{y^2}{2}$$

$$\emptyset(x,y) = \frac{y}{x} + \frac{y^2}{2}$$

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Let $M = 2y$ and $N = (x+y)$

$$\frac{\partial M}{\partial y} = 2, \frac{\partial N}{\partial x} = 1$$

$$-\frac{1}{M}(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}) = \frac{1}{2y}$$

$$I = \int\frac{1}{2y}dy = \frac{1}{\sqrt{y}}$$

$$\frac{2y}{\sqrt{y}}dx + \frac{x+y}{\sqrt{y}}dy = 0$$

$$\emptyset(x,y) = \int\frac{2y}{\sqrt{y}}dx + g(y) = \frac{2xy}{\sqrt{y}} + g(y)$$

$$\frac{\partial\emptyset}{\partial y} = 3x\sqrt{y} + g'(y) = \frac{x+y}{\sqrt{y}}$$

$$\Rightarrow g(y) = 2x\sqrt{y} + \frac{2}{3}y^{3/2} - 2xy^{3/2}$$

$$\emptyset(x,y) = 2x\sqrt{y} + \frac{2}{3}y^{3/2}$$