

Exact differential equation

Practice Problems (Hints and Answer)

Verify the given differential equation is exact or not. If so, then solve it.

1. $ye^{xy}dx + (xe^{xy} + 2y)dy = 0$

Ans: $\frac{\partial M}{\partial y} = xye^{xy} + e^{xy}$ $\frac{\partial N}{\partial x} = e^{xy} + xye^{xy}$

Solution is, $e^{xy} + y^2 = C$

2. $(\sin x \cos y + e^x)dx + (\cos x \sin y + \tan y)dy = 0$

Ans: $\frac{\partial M}{\partial y} = -\sin x \sin y$ $\frac{\partial N}{\partial x} = -\sin x \sin y$

Solution is, $-\cos x \cos y + e^x + \log \sec y = C$

3. $\left(1 + e^{\frac{x}{y}}\right)dx + \left(1 - \frac{x}{y}\right)e^{\frac{x}{y}}dy = 0$

Ans: $\frac{\partial M}{\partial y} = -\frac{x}{y^2} e^{\frac{x}{y}}$ $\frac{\partial N}{\partial x} = -\frac{x}{y^2} e^{\frac{x}{y}}$

Solution is, $x + ye^{\frac{x}{y}} = C$

4. $(\sec x \tan x \tan y - e^x)dx + \sec x \sec^2 y dy = 0$

Ans: $\frac{\partial M}{\partial y} = \sec x \tan x \sec^2 y$ $\frac{\partial N}{\partial x} = \sec^2 y \sec x \tan x$

Solution is, $\sec x \tan y - e^x = C$

5. $(y^2 e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$

Ans: $\frac{\partial M}{\partial y} = 2xy^3 e^{xy^2} + 2ye^{xy^2}$ $\frac{\partial N}{\partial x} = 2xy^3 e^{xy^2} + 2ye^{xy^2}$

Solution is, $e^{xy^2} + x^4 - y^3 = C$