The differential equation $(x^2 + ay)dx - (y^2 - ax)dy = 0$ is

a) Not exact b) exact with $\frac{\partial M}{\partial y} = -a$ c) exact with $\frac{\partial N}{\partial x} = a$ d) homogeneous

The differential equation $(y - xy^2)dx + (x^2y - x)dy = 0$ is

a) Not exact b) exact with $\frac{\partial M}{\partial y} = -x$ c) exact with $\frac{\partial N}{\partial x} = -1 + 2xy$ d) exact

There exists a function $u = u(x, y)$ such that $du = Mdx + Ndy$ where M and N are functions of x and y.

Then which of the following option is always correct for the differential equation $dx + Ndy = 0$?

a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ b) $\frac{\partial M}{\partial x} = -\frac{\partial N}{\partial y}$ c) $\frac{\partial M}{\partial y} = 2\frac{\partial N}{\partial x}$ d) None of these

For a non exact first order differential equation $Mdx + Ndy = 0$, which of following result lead to give an integrating factor ?

a) $\frac{1}{N}\left(\frac{\partial M}{\partial y} + \frac{\partial N}{\partial x}\right) = f(x)$ b) $\frac{1}{M}\left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) = f(y)$ c) $\frac{1}{M}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right) = f(x)$ d) $\frac{1}{M}\left(\frac{\partial M}{\partial y} + \frac{\partial N}{\partial x}\right) = f(x)$

The integrating factor of the differential equation $(x^2y - 2xy^2)dx - (x^3 - 3xy^2)dy = 0$ is

a) $\frac{1}{xy}$ b) $\frac{1}{x^2y}$ c) $\frac{1}{xy^2}$ d) $\frac{1}{x^2y^2}$

The general solution of the equation $xdy - ydx = (x^2 + y^2)dx$ is

a) $y = x\tan e^x$ b) $y = x\tan x$ c) $y = x\tan(e^x + c)$ d) $y = x\tan(x + c)$

The integrating factor of the differential equation $ydx - xdy + \log x\, dx = 0$ is

a) $\frac{2}{x}$ b) $\frac{2}{y}$ c) $-\frac{2}{x}$ d) $-\frac{2}{y}$

The integrating factor of the differential equation $(y^2 + x^2)dx = 2xy\, dy$ is

a) $\frac{1}{xy(x-y)}$ b) $\frac{1}{(x-y)(x+y)}$ c) $-\frac{1}{xy(x+y)}$ d) $\frac{1}{x(x-y)(x+y)}$

Under what conditions, the differential equation $[xf(x) - g(y)]dx + [h(x) + yk(y)]dy = 0$ is exact?

a) $g'(y) = h'(x)$ b) $f'(x) = -k'(y)$ c) $g'(y) = -h'(x)$ d) $f'(x) = k'(x)$

A particular solution of the differential equation $p = \sin(y - xp), y(\pi) = 0$ is

a) $y = 0$ b) $y = x$ c) $y = -x$ d) $y = 5$

The general solution of the differential equation $\log(y - px) = p$ is

a) $y = cx + e^c$ b) $y = cx + \log c$ c) $y = -cx$ d) $y = cx - \log c$

Integrating factor of the differential equation $\frac{dy}{dx} - y\sin x = \frac{\sin 2x}{2}$ is

a) $-\cos x$ b) $e^{\cos x}$ c) $e^{\sin x}$ d) $\sin x$

The solution of the differential equation $(x^2 - 5y)dx + (y^2 - 5x)dy = 0, y(0) = 0$ is

a) $x^3 - y^3 = 3xy$ b) $x^3 + y^3 = 5xy$ c) $x^3 - y^3 = 15axy$ d) $x^3 + y^3 = 15xy$