Quiz 2 solution

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1 D

First we check whether this differential equation is exact.

$$(y + \sin x)dx + (x + 2y - 3y^2)dy = Mdx + Ndy = 0$$

And this gives us

$$M = y + \sin x$$
$$N = x + 2y + 3y^2$$

And we compute

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

so this problem is exact. And according to the theorem, we are going to find the function F, where

$$F(x,y) = \int M dx + g(y) = xy - \cos x + g(y)$$
$$F(x,y) = \int N dy + h(x) = xy + y^2 - y^3 + h(x)$$

After comparing with this two equation, we got

$$F(x,y) = xy - \cos x + y^2 - y^3$$

2 A

Since this is Bernoulli equation, we are going to divide y^3 on both side of the equation. And we will got

$$\frac{1}{y^3}\frac{dy}{dx} - \frac{2}{3x}y^{-2} = 2\ln x$$

And if we use substitution $v = y^{-2}$, we will have $dv = -2y^{-3}dy$, hence $\frac{1}{y^3}dy = -\frac{1}{2}dv$ And we got the equation

$$-\frac{1}{2}\frac{dv}{dx} - \frac{2}{3x}v = 2\ln x$$

Which is equivalent to

$$\frac{dv}{dx} + \frac{4}{3x}v = -4\ln x$$

Corresponding to Choice A