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MID TERM.

Day M T W T F S ✓

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20P-0101.

→ Find the value of k
for which the given
differential equation is exact.

$$(6xy^3 + \cos y)dx + (2kx^2y^2 - x \sin y)dy = 0$$

The given differential equation
is,

$$(6xy^3 + \cos y)dx + (2kx^2y^2 - x \sin y)dy = 0$$

Rewrite the equation in the
form $Mdx + Ndy = 0$ we have,

$$M = 6xy^3 + \cos y \quad N = 2kx^2y^2 - x \sin y$$

We need to find the value of
 k such that $M_y = N_x$.

$$\text{Here, } M_y = \frac{\partial M}{\partial y}, \quad N_x = \frac{\partial N}{\partial x}$$

Now notice that,

$$\cancel{M_x} \quad M_y = 18xy^2 - \sin y$$

$$N_x = 4kxy^2 - \sin y$$

Now in order to make $M_y = N_x$ we get,

$$4k = 18 \Rightarrow k = \frac{9}{2}$$

$$\boxed{k = \frac{9}{2}}$$