AP Multiple-Choice
NON-Calculator

1. Suppose $\boxed{xy = 1.}$ Find the value of $\frac{dy}{dx}$ at x = -2.

$xy = 1$
$-2y = 1$
$y = -\frac{1}{2}$

A. $\frac{3}{4}$

B. $\frac{1}{2}$

C. 0

D. $\boxed{-\frac{1}{4}}$

E. Not enough information

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

$\boxed{\left.\frac{dy}{dx}\right|_{(-2,-\frac{1}{2})} = -\frac{1}{4}}$

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2. Find $\frac{dy}{dx}$ when $x^2 - xy + y^4 = 17$.

A. $\frac{dy}{dx} = \frac{-2x}{4y^3 - x}$

B. $\boxed{\frac{dy}{dx} = \frac{y - 2x}{4y^3 - x}}$

C. $\frac{dy}{dx} = \frac{y - 2x}{4y^3}$

D. $\frac{dy}{dx} = \frac{17 - 2x}{4y^3 - x}$

E. Not enough information

$x^2 - (xy) + y^4 = 17$
$2x - \left[y \cdot 1 + x\frac{dy}{dx}\right] + 4y^3\frac{dy}{dx} = 0$
$2x - y - x\frac{dy}{dx} + 4y^3\frac{dy}{dx} = 0$
$-x\frac{dy}{dx} + 4y^3\frac{dy}{dx} = -2x + y$
$\frac{dy}{dx}(-x + 4y^3) = -2x + y$
$\boxed{\frac{dy}{dx} = \frac{-2x + y}{-x + 4y^3}}$

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3. Find $\frac{dy}{dx}$ when $\cos(\underbrace{x + 3y}_{\text{out}}) = \underbrace{x}\underbrace{\tan y}$.

in

A. $\frac{dy}{dx} = \frac{-\tan y}{x\sec^2 y + 3\sin(x + 3y)}$

B. $\frac{dy}{dx} = -\frac{\sin(x + 3y)}{x\sec^2 y + 3\sin(x + 3y)}$

C. $\frac{dy}{dx} = -\frac{\sin(x + 3y) + \tan y}{x\sec^2 y}$

D. $\frac{dy}{dx} = -\frac{\sin(x + 3y) + \tan y}{x\sec^2 y + \cos(x + 3y)}$

E. $\boxed{\frac{dy}{dx} = -\frac{\sin(x + 3y) + \tan y}{x\sec^2 y + 3\sin(x + 3y)}}$

$\left(1 + 3\frac{dy}{dx}\right) \cdot -\sin(x + 3y) = \tan y \cdot 1 + x \cdot \sec^2 y\frac{dy}{dx}$
$-\sin(x+3y) - 3\sin(x+3y)\frac{dy}{dx} = \tan y + x\sec^2 y\frac{dy}{dx}$
$-3\sin(x+3y)\frac{dy}{dx} - x\sec^2 y\frac{dy}{dx} = \tan y + \sin(x+3y)$
$\frac{dy}{dx}\left(-3\sin(x+3y) - x\sec^2 y\right) = \tan y + \sin(x+3y)$
$\frac{dy}{dx} = \frac{\tan y + \sin(x+3y)}{-3\sin(x+3y) - x\sec^2 y}$
$= \frac{\tan y + \sin(x+3y)}{-(3\sin(x+3y) + x\sec^2 y)}$