— Equations of Lines (with ID):

③ Find eqn of tangent to $x^2 - xy + y^2 = 7$ at $(-1, 2)$

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

$$2x - x\frac{dy}{dx} - y + 2y\frac{dy}{dx} = 0$$

$$-x\frac{dy}{dx} + 2y\frac{dy}{dx} = -2x + y$$

$$\frac{dy}{dx}(-x + 2y) = -2x + y$$

$$\frac{dy}{dx} = \frac{-2x + y}{-x + 2y}$$

$$\text{Slope} = \frac{-2(-1) + 2}{1 + 2(2)} = \frac{2 + 2}{1 + 4} = \frac{4}{5}$$

$$y - 2 = \frac{4}{5}(x + 1)$$

① Find slope of tangent line of $x\cos y = 1$ at $\left(2, \frac{\pi}{3}\right)$.

$$x \cdot -\sin y\frac{dy}{dx} + \cos y \cdot 1 = 0$$

$$-x\sin y\frac{dy}{dx} = -\cos y$$

$$\frac{-x\sin y\frac{dy}{dx}}{-x} = \frac{-\cos y}{-x}$$

$$\sin y\frac{dy}{dx} = \frac{\cos y}{x}$$

$$* \quad \frac{dy}{dx} = \frac{\cos y}{\sin y \cdot x}$$

$$\frac{\cos\frac{\pi}{3}}{\sin\frac{\pi}{3} \cdot 2} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2} \cdot 2}$$

$$* = \boxed{\frac{1}{2\sqrt{3}}}$$