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D) $y = \tan^{-1}(3x^4)$

$\tan y = 3x^4$ —①

$\frac{dy}{dx}\sec^2 y = 12x^3$

$\frac{dy}{dx} = \frac{12x^3}{\sec^2 y}$ —②

from Pythagorean identity

$\sec^2 y = 1 + \tan^2 y$ —②

sub ② in ③

$\frac{dy}{dx} = \frac{12x^3}{1 + \tan^2 y}$ —④

Sub ① in ④

$\frac{dy}{dx} = \frac{12x^3}{1 + (3x^4)^2} = \frac{12x^3}{1 + 9x^8}$

2) $u = \sin^{-1} 3k$

$u = \sin$ 3k

$\sin u = 3k$ —①

$\frac{du}{dk}\cos u = 3$

$\frac{du}{dk} = \frac{3}{\cos u}$ —②

Sub the Pythagorean identity

$\cos^2 u + \sin^2 u = 1$

$\cos^2 u = 1 - \sin^2 u$

$\cos u = \sqrt{1 - \sin^2 u}$ —③

sub ③ in ②

$$\frac{du}{dk} = \frac{3}{\sqrt{1 - \sin^2 u}}$$

Sub ① in eqn

$$\frac{du}{dk} = \frac{3}{\sqrt{1 - (3k)^2}}$$

$$\therefore \frac{du}{dk} = \frac{3}{\sqrt{1 - 9k^2}}$$

③ $y = \sin^{-1} x^2$

$$y = \frac{x^2}{\sin}$$

$$\sin y = x^2 \quad \text{—①}$$

$$\frac{dy}{dx} \cos y = 2x$$

$$\frac{dy}{dx} = \frac{2x}{\cos y}$$

Sub in the Pythagorean ✱ identity

$$\cos^2 y + \sin^2 y = 1$$

$$\cos^2 y = 1 - \sin^2 y \qquad \cos y = \sqrt{1 - \sin^2 y}$$

$$\therefore \frac{dy}{dx} = \frac{2x}{\sqrt{1 - \sin^2 y}} \quad \text{—④}$$

Sub ① in ④

$$\frac{dy}{dx} = \frac{2x}{\sqrt{1 - (x^2)^2}} = \frac{2x}{\sqrt{1 - x^4}}$$