

Inverse Trig Functions Derivatives

Date _____

Period _____

Differentiate each function with respect to x .

1) $y = \tan^{-1}(5x^4)$

$$y' = \frac{20x^3}{1 + (5x^4)^2}$$

$$y' = \frac{20x^3}{1 + 25x^8}$$

2) $y = \cos^{-1}(x^5)$

$$\frac{dy}{dx} = \frac{-(5x^4)}{\sqrt{1 - (x^5)^2}}$$

$$\frac{dy}{dx} = \frac{-5x^4}{\sqrt{1 - x^{10}}}$$

3) $y = \sin^{-1}(3x^5)$

$$y' = \frac{15x^4}{\sqrt{1 - (3x^5)^2}}$$

$$y' = \frac{15x^4}{\sqrt{1 - 9x^{10}}}$$

4) $y = \tan^{-1}(2x^4)$

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

$$\frac{dy}{dx} = \frac{8x^3}{1 + 4x^8}$$

5) $y = \cos^{-1}(-4x^5)$

$$\frac{dy}{dx} = \frac{-(-20x^4)}{\sqrt{1 - (-4x^5)^2}}$$

$$\frac{dy}{dx} = \frac{20x^4}{\sqrt{1 + 16x^{10}}}$$

6) $y = \cos^{-1}(2x^4)$

$$y' = \frac{-(8x^3)}{\sqrt{1 - (2x^4)^2}}$$

$$y' = \frac{-8x^3}{\sqrt{1 - 4x^8}}$$

7) $f(x) = \cos^{-1}(2x^5)$

$$f'(x) = \frac{-(10x^4)}{\sqrt{1 - (2x^5)^2}}$$

$$f'(x) = \frac{-10x^4}{\sqrt{1 - 4x^{10}}}$$

8) $y = \tan^{-1}(5x^5)$

$$y' = \frac{25x^4}{1 + (5x^5)^2}$$

$$y' = \frac{25x^4}{1 + 25x^{10}}$$

$$9) f(x) = \cos^{-1}(5x^2)$$

$$f'(x) = \frac{- (10x)}{\sqrt{1 - (5x^2)^2}}$$

$$f'(x) = \frac{-10x}{\sqrt{1 - 25x^4}}$$

$$11) y = (\sin^{-1}(3x^3))^3$$

$$\frac{dy}{dx} = 3(\sin^{-1}(3x^3))^2 \cdot \frac{9x^2}{\sqrt{1 - (3x^3)^2}}$$

$$\frac{dy}{dx} = \frac{27(\sin^{-1}(3x^3))^2}{\sqrt{1 - 9x^2}}$$

$$12) f(x) = \cos^{-1}(2x^2 + 5)^4$$

$$f'(x) = \frac{-4(2x^2 + 5)^3 \cdot 4x}{\sqrt{1 - [(2x^2 + 5)^4]^2}}$$

$$f'(x) = \frac{-16x(2x^2 + 5)^3}{\sqrt{1 - (2x^2 + 5)^8}}$$

$$13) y = (\sin^{-1} -2x^5)^4$$

$$y' = 4(\sin^{-1}(-2x^5))^3 \cdot \frac{(-10x^2)}{\sqrt{1 - (-2x^5)^2}}$$

$$y' = \frac{-40x^2(\sin^{-1}(-2x^5))^3}{\sqrt{1 - 4x^{10}}}$$

$$14) f(x) = \tan^{-1}(3x^5 - 2)^3$$

$$f'(x) = \frac{3(3x^5 - 2)^2 \cdot (15x^4)}{1 + ((3x^5 - 2)^3)^2}$$

$$f' = \frac{45(3x^5 - 2)^2}{1 + (3x^5 - 2)^6}$$

$$15) f(x) = (\cos^{-1} -x^4)^3$$

$$f' = \frac{3(\cos^{-1}(-x^4))^2 \cdot -(-4x^3)}{\sqrt{1 - (-x^4)^2}}$$

$$f' = \frac{12x^3(\cos^{-1}(-x^4))^2}{\sqrt{1 - x^8}}$$

$$10) y = \tan^{-1}(-4x^5)$$

$$y' = \frac{-20x^4}{1 + (-4x^5)^2}$$

$$y' = \frac{-20x^4}{1 + 16x^{10}}$$

$$16) y = \cos^{-1} 5x^5$$

$$y' = \frac{-(25x^4)}{\sqrt{1 - (5x^5)^2}}$$

$$y' = \frac{-25x^4}{\sqrt{1 - 25x^{10}}}$$

$$17) f(x) = (\tan^{-1} -2x^4)^2$$

$$f' = 2(\tan^{-1}(2x^4))' \cdot \frac{8x^3}{1 + (2x^4)^2}$$

$$f' = \frac{16x^3 \tan^{-1}(2x^4)}{1 + 4x^8}$$

$$18) y = \tan^{-1} -5x^5$$

$$\frac{dy}{dx} = \frac{-25x^4}{1 + (-5x^5)^2}$$

$$\frac{dy}{dx} = \frac{-25x^4}{1 + 25x^{10}}$$

$$19) y = \sin^{-1}(x^5 - 3)^2$$

$$y' = \frac{2(x^5 - 3) \cdot 5x^4}{\sqrt{1 - ((x^5 - 3)^2)^2}}$$

$$y' = \frac{10x^4(x^5 - 3)}{\sqrt{1 - (x^5 - 3)^4}}$$

$$20) y = \tan^{-1}(x^4)$$

$$y' = \frac{4x^3}{1 + (x^4)^2}$$

$$y' = \frac{4x^3}{1 + x^8}$$