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	Find the equation of the tangent line *F*) $y = \csc^{-1}x$ at $x = 2$ $\frac{dy}{dx} = \frac{-1}{\lvert x\rvert\sqrt{x^2-1}}$ $\left.\frac{dy}{dx}\right\rvert_{x=2} = \frac{-1}{\lvert 2\rvert\sqrt{3}} = \frac{-1}{2\sqrt{3}}$ ratio angle $y = \csc^{-1}(2)$ $y = \sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$ $\boxed{y = \frac{\pi}{6} - \frac{1}{2\sqrt{3}}(x-2)}$ $y = \csc x \rightarrow y = \frac{1}{\sin x}$ G) Find the derivative of $f(x) = \sin x$ at $x = \frac{\pi}{6}$ $f'(x) = \cos x$ $f'\left(\frac{\pi}{6}\right) = \cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$ H) Find the derivative of $f(x) = \arcsin x$ at $x = \frac{1}{2}$ $f'(x) = \frac{1}{\sqrt{1-x^2}}$ $f'\left(\frac{1}{2}\right) = \frac{1}{\sqrt{1-\left(\frac{1}{2}\right)^2}}$

g(x) is inverse of f(x)

f(x)	g(x)
(3,15)	(15,3)
m = -8	$m = -\frac{1}{8}$

1. Let f be a differentiable function such that f(3) = 15, f(6) = 3, $f'(3) = -8$ and $f'(6) = -2$.

   The function g is differentiable and $g(x) = f^{-1}(x)$ for all x. What is the value of $g'(15)$?

   a) -1/2 b) -1/8 c) 1/6 d) 1/3

   e) The value of $g'(15)$ cannot be determined

f(x)	$f^{-1}(x)$ g(x)
(8,4)	(4,8)
m = 3	$m = \frac{1}{3}$

2. Let f be a differentiable function such that f(3) = 5, f(8) = 4, $f'(3) = 6$ and $f'(8) = 3$.

   slope

   The function g is differentiable and $g(x) = f^{-1}(x)$ for all x. What is the value of $g'(4)$?

   a) -1/2 b) -1/8 c) 1/6 d) 1/3

   e) The value of $g'(4)$ cannot be determined

3. Let f be a differentiable function such that f(3) = 5, f(8) = 4, $f'(3) = 6$ and $f'(8) = 3$.
The function g is differentiable and $g(x) = f^{-1}(x)$ for all x. What is the value of $g'(5)$?

a) -1/2 b) -1/8 c) 1/6 d) 1/3
e) The value of $g'(5)$ cannot be determined

4. If $f(2) = -3$, $f'(2) = \frac{4}{3}$, and $g(x) = f^{-1}(x)$, what is the equation of the tangent line to g(x) at x = -3?

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

A) $y-2 = \frac{-3}{4}(x+3)$ B) $y+2 = \frac{-3}{4}(x-3)$

C) $y-2 = \frac{3}{4}(x+3)$ D) $y+3 = \frac{3}{4}(x-2)$

E) $y-2 = \frac{4}{3}(x+3)$

$f(x)$	$g(x) = f^{-1}(x)$
$(2, -3)$	$(-3, 2)$
$m = \frac{4}{3}$	$m = \frac{3}{4}$

5. If $f(2) = -3$, $f'(2) = \frac{-4}{3}$, and $g(x) = f^{-1}(x)$, what is the equation of the tangent line to g(x) at x = -3?

$f(2) = -3$ $f'(2) = -\frac{4}{3}$
$(2, -3)$ $m = -\frac{4}{3}$
$g \to f^{-1}(x)$
$(-3, 2)$ $m = -\frac{3}{4}$

A) $y-2 = \frac{-3}{4}(x+3)$ B) $y+2 = \frac{-3}{4}(x-3)$

C) $y-2 = \frac{3}{4}(x+3)$ D) $y+2 = \frac{4}{3}(x-3)$

E) $y-2 = \frac{4}{3}(x+3)$

6. If $f(2) = -3$, $f'(2) = \frac{-3}{4}$, and $g(x) = f^{-1}(x)$,

what is the equation of the tangent line to g(x)

at x = -3?

A) $y-2 = \frac{-3}{4}(x+3)$

B) $y+3 = \frac{-4}{3}(x+2)$

C) $y-2 = \frac{3}{4}(x+3)$

D) $y+2 = \frac{4}{3}(x-3)$

E) $y-2 = \frac{-4}{3}(x+3)$

What you'll Learn About
How to take the derivative of exponential and logarithmic functions

$\cancel{y = 5^x}$
$\cancel{y' = x5^{x-1}}$

$y = x^5$
$y' = 5x^4$

A) $y = 5^x$
$y' = 5^x \cdot \ln 5 \cdot 1$

B) $y = 7^{x^2}$
$y' = 7^{x^2} \cdot \ln 7 \cdot 2x$

C) $y = 5^{\sin x}$
$y' = 5^{\sin x} \cdot \ln 5 \cdot \cos x$

D) $y = 6^{\arctan x^3}$

ratio

$y = 6^{\arctan(x^3)}$

$y' = 6^{\arctan x^3} \cdot \ln 6 \cdot \frac{1}{1+(x^3)^2} \cdot 3x^2$

$y = \ln(5e)$
$y = \ln 5 + \ln e$
$y = \ln 5 + 1$

E) $\boxed{y = e^x}$
$y' = e^x \cdot (\ln e) \cdot 1$
$\boxed{y' = e^x}$

F) $y = 5e^{5x}$
$y' = 5(e^{5x}) \ln e \cdot 5$
$\boxed{y' = 25e^{5x}}$

$y = \ln_e(5e)$
$e^y = 5e$

$y = \ln_e e$
$e^y = e$

G) $y = (5e)^{5x}$
$y' = (5e)^{5x} \cdot \ln(5e) \cdot 5$

H) $y = e^{\frac{-3}{4}x}$
$y' = e^{-3/4} \cdot \ln e \cdot -\frac{3}{4}$

I) $y = x^3 e^{4x} - x^4 e^{2x}$

B) ~~$y = 7^{x^2}$~~

$y' = x^3(e^{4x} \cdot \ln e \cdot 4) + e^{4x}(3x^2) - [x^4(e^{2x} \cdot \ln e \cdot 2) + e^{2x}(4x^3)]$

$y' = 4x^3e^{4x} + 3x^2e^{4x} - 2x^4e^{2x} - 4x^3e^{2x}$