

U3H2

Find the derivative of each function.

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

2. $y = (4t-3)^{-8}$

3. $f(\theta) = \theta + 2 \tan \sqrt[3]{\theta}$

4. $g(z) = \sqrt[3]{2z-1}$

5. Find $\frac{d^2y}{dx^2}$ of $y = x \cos(5x)$.

Find the indicated derivative.

6. $\lambda = \left(\frac{au+b}{cu+d} \right)^6$; find $\frac{d\lambda}{du}$.

7. $y = \cot^3(\pi - \theta)$; find $\frac{dy}{d\theta}$.

(a, b, c, d are constants)

Find an equation for the tangent line to the graph at the specified point.

8. $y = x \cos(3x)$, $x = \pi$

9. $y = \left(x - \frac{1}{x} \right)^3$, $x = 1$

Multiple Choice:

10. If $f(x) = \frac{1}{x^2+1}$ and $g(x) = \sqrt{x}$, then the derivative of $f(g(x))$ is:

a. $\frac{-\sqrt{x}}{(x^2+1)}$ b. $-(x+1)^{-2}$ c. $\frac{1}{(x+1)^2}$ d. $\frac{1}{2\sqrt{x}(x+1)}$

Homework #18 U3H2 answers $(x-3) = y' = -\csc x \cot x$

Find the derivative of each function. Simplify your final answer.

1. $y = \frac{1}{4 \sin(x-3)} = (\frac{1}{4} \sin(x-3))^{-1}$
 $y' = -1 (\frac{1}{4} \sin(x-3))^{-2} \cdot \frac{1}{4} \cos(x-3)$

2. $y = (4t-3)^{-8}$
 $y' = -8(4t-3)^{-9} \cdot 4$
 $= -32(4t-3)^{-9}$

3. $f(\theta) = \theta + 2 \tan \sqrt[3]{\theta}$
 $f'(\theta) = (1 + 2 \tan^2 \sqrt[3]{\theta}) \cdot (\frac{1}{3} \theta^{-2/3})$

4. $g(z) = \sqrt[3]{2z-1}$
 $g'(z) = \frac{1}{3} (2z-1)^{-2/3} \cdot 2$

5. Find $\frac{d^2 y}{dx^2}$ of $y = x \cos(5x) \sin x$.

$y' = x \cdot (-\sin 5x) \cdot 5 + \cos 5x \cdot \sin x = -5x \sin 5x + \cos 5x \sin x$
 $y'' = -5x \cos 5x \cdot 5 + \sin 5x \cdot -5 + \cos 5x \cdot \cos x = -25x \cos 5x - 5 \sin 5x + \cos 5x \cos x$

Find the indicated derivative.

6. $\lambda = \left(\frac{au+b}{cu+d}\right)^6$; find $\frac{d\lambda}{du}$.

(a, b, c, d are constants)
 $\frac{d\lambda}{du} = 6 \left(\frac{au+b}{cu+d}\right)^5 \cdot \frac{(cu+d) \cdot a - (au+b)(c)}{(cu+d)^2}$

7. $y = \cot^3(\pi - \theta)$; find $\frac{dy}{d\theta}$.

$\frac{dy}{d\theta} = 3[\cot(\pi - \theta)]^2 \cdot -\csc^2(\pi - \theta) \cdot -1$
 $= 3(\cot(\pi - \theta))^2 \cdot \csc^2(\pi - \theta)$

Find an equation for the tangent line to the graph at the specified point.

8. $y = x \cos(3x)$, $x = \pi$ pt $(\pi, \pi \cos(3\pi))$
 $y + \pi = -1(x - \pi)$
 $y = -x + \pi - \pi$
 $y = -x$

9. $y = \left(x - \frac{1}{x}\right)^3$, $x = 1$

$y' = m = x(-\sin 3x) \cdot 3 + \cos 3x(1)$

$m = y' = 3\left(x - \frac{1}{x}\right)^2 \cdot \left(1 + \frac{1}{x^2}\right)$
 $y'(1) = 3(0) \cdot 0 = 0$

10. $y = \sin x + \cos x$, $x = \pi$
 $y'(\pi) = \pi(-\sin 3\pi) \cdot 3 + \cos 3\pi$

$y = \sin x + \cos x$, $x = \pi$

$y - \pi \cos 3\pi = [-3\pi \sin 3\pi + \cos 3\pi](x - \pi)$

Multiple Choice:

11. If $f(x) = \frac{1}{x^2+1}$ and $g(x) = \sqrt{x}$, then the derivative of $f(g(x))$ is:

a. $\frac{-\sqrt{x}}{(x^2+1)}$ b. $-(x+1)^{-2}$ c. $\frac{1}{(x+1)^2}$ d. $\frac{1}{2\sqrt{x}(x+1)}$
 $= f'(g(x)) \cdot g'(x)$
 $= f'(\sqrt{x}) \cdot \frac{1}{2} x^{-1/2}$