

Worksheet on Chain Rule

What you don't finish is your homework for the night.

Show all work, including rewriting the original problem in a more useful way. No calculator unless otherwise stated.

1. Find the derivative of the following functions with respect to the independent variable.

(a) $y = (2x - 7)^3$

(b) $y = \frac{1}{t^2 + 3t - 1}$

(c) $y = \left(\frac{1}{t-3}\right)^2$

(d) $y = \csc^3\left(\frac{3x}{2}\right)$

(e) $y = 3 \sec^2(\pi t - 1)$

(f) $y = \sin \sqrt[3]{x} + \sqrt[3]{\sin x}$

(g) $y = x^2 \tan \frac{1}{x}$

(h) $r = \sec 2\theta \tan 2\theta$

2. Find the equation of the tangent line for each of the following at the indicated point.

(a) $s(t) = \sqrt{t^2 + 2t + 8}$ at $x = 2$

(b) $f(t) = \frac{3t+2}{t-1}$ at $(0, -2)$

4. Find the second derivative of each of the following functions. Remember to simplify early and often.

(a) $f(x) = 2(x^2 - 1)^3$

(b) $f(x) = \sin(x^2)$

5. If $h(x) = \tan(2x)$, evaluate $h''(x)$ at $\left(\frac{\pi}{6}, \sqrt{3}\right)$. Simplify early and often.

6. If $g(5) = -3$, $g'(5) = 6$, $h(5) = 3$, and $h'(5) = -2$, find $f'(5)$ (if possible) for each of the following. If it is not possible, state what additional information is required.

(a) $f(x) = \frac{g(x)}{h(x)}$

(b) $f(x) = g(h(x))$

(c) $f(x) = g(x)h(x)$

(d) $f(x) = [g(x)]^3$

(e) $f(x) = g(x+h(x))$

(f) $f(x) = (g(x)+h(x))^{-2}$

Multiple Choice

_____ 14. If $f(x) = \frac{1}{\sqrt{x^2+3}}$, find $f'(x)$.

(A) $f'(x) = -\frac{x}{\sqrt{(x^2+3)^3}}$

(B) $f'(x) = \frac{x}{\sqrt{x^2+3}}$

(C) $f'(x) = -\frac{x}{(x^2+3)\sqrt{2x}}$

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

(E) $f'(x) = -\frac{x^2+3x}{x^2+3}$

15. If $g(x) = (1-x)^3(4x+1)$, then $g'(x) =$

(A) $-12(1-x)^2$

(B) $(1-x)^2(1+8x)$

(C) $(1-x)^2(1-16x)$

(D) $3(1-x)^2(4x+1)$

(E) $(1-x)^2(16x+7)$

16. $\frac{d}{dx} \left[\left(\frac{x^2-3}{5x^2-9} \right)^5 \right] =$

(A) $\frac{10x(x^2-3)^4(10x^2-17)}{(5x^2-9)^6}$

(B) $\frac{-10x(x^2-3)^4(5x^2-16)}{(5x^2-9)^5}$

(C) $\frac{-240x(x^2-3)^4}{(5x^2-9)^6}$

(D) $\frac{60x(x^2-3)^4}{(5x^2-9)^6}$

(E) $\frac{100x(x^2-3)^4}{(5x^2-9)^6}$