4.1 Practice

Thursday, September 29, 2016 10:28 AM

Calculus Worksheet
Chain Rule Practice #1

Find the derivative of each of the following functions.

1. $y = (x^2 + 4x + 6)^5$

$y' = 5(x^2+4x+6)^4(2x+4)$

2. $y = \tan 3x$

$y' = \sec^2 3x \cdot 3$

$= 3\sec^2 3x$

3. $f(x) = (x^3 - 5x)^4$

$f'(x) = 4(x^3-5x)^3 \cdot (3x^2-5)$

4. $y = 4\sec 5x$

$y' = 4\sec 5x \tan 5x \cdot 5$

$= 20\sec 5x \tan 5x$

5. $f(x) = (3x-2)^{10}(5x^2 - x + 1)^{12}$

$f'(x) = (3x-2)^{10} \cdot 12(5x^2-x+1)^{11} \cdot (10x-1)$

$+ 10(3x-2)^9(3) \cdot (5x^2-x+1)^{12}$

$= 12(3x-2)^{10}(5x^2-x+1)^{11}(10x-1) + 30(3x-2)^9(5x^2-x+1)^{12}$

6. $y = \cos(x^3)$

$y' = -\sin(x^3) \cdot 3x^2$

$= -3x^2\sin(x^3)$

7. $f(x) = (6x^2+5)^3(x^3-7)^4$

$f'(x) = (6x^2+5)^3 \cdot 4(x^3-7)^3 \cdot 3x^2 +$

$3(6x^2+5)^2 \cdot 12x \cdot (x^3-7)^4$

$= 12x^2(6x^2+5)^3(x^3-7)^3 + 36x(6x^2+5)^2(x^3-7)^4$

8. $y = \cos^3 x = (\cos x)^3$

$y' = 3\cos^2 x \cdot -\sin x$

$= -3\cos^2 x \sin x$

9. $y = (2x^2 - 6x + 1)^{-8}$

$y' = -8(2x^2-6x+1)^{-9} \cdot (4x-6)$

$= \dfrac{-8(4x-6)}{(2x^2-6x+1)^9}$

10. $f(x) = (1 + \cos^2 x)^6$

$f'(x) = 6(1+\cos^2 x)^5 \cdot 2\cos x \cdot -\sin x$

$= -12\cos x \sin x (1+\cos^2 x)^5$

Chain Rule Practice #1 Answers Ignore! ☺

1. $y' = 10(x+2)(x^2+4x+6)^4$

2. $f'(x) = 4(3x^2-5)(x^3-5x)^3$

3. $f'(x) = 6(3x-2)^9(5x^2-x+1)^{11}(85x^2-51x+9)$

4. $f'(x) = 12x(6x^2+5)^2(x^3-7)^3(9x^3+5x-21)$

5. $y' = -16(2x-3)(2x^2-6x+1)^{-9}$ or $y' = \dfrac{-16(2x-3)}{(2x^2-6x+1)^9}$

6. $y' = \dfrac{1}{2}(2x-7)(x^2-7x)^{-\frac{1}{2}}$ or $y' = \dfrac{(2x-7)}{2\sqrt{x^2-7x}}$

7. $y' = -8(x-1)(x^2-2x-5)^{-5}$ or $y' = \dfrac{-8(x-1)}{(x^2-2x-5)^5}$

8. $f'(x) = \dfrac{3}{2}\left(x-\dfrac{1}{x}\right)^{\frac{1}{2}}\left(1+\dfrac{1}{x^2}\right)$

9. $y' = \dfrac{39(x-6)^2}{(x+7)^4}$

10. $y' = \dfrac{-2}{\sqrt[5]{(2x-1)^6}}$

Calculus Worksheet
Chain Rule Practice #2

Find the derivative of each of the following functions.

1. $y = \sqrt{x^2 - 7x} = (x^2 - 7x)^{\frac{1}{2}}$

$y' = \frac{1}{2}(x^2-7x)^{-\frac{1}{2}} \cdot (2x-7)$

$= \frac{2x-7}{2\sqrt{x^2-7x}}$

2. $y = \tan(x^2) + \tan^2 x$

$y' = \sec^2(x^2) \cdot 2x + 2\tan x \cdot \sec^2 x$

$= 2x\sec^2(x^2) + 2\tan x \sec^2 x$

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

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

$= \frac{-4(2x-2)}{(x^2-2x-5)^5} = \frac{-8x+8}{(x^2-2x-5)^5}$

4. $y = \cos(\tan x)$

$y' = -\sin(\tan x) \cdot \sec^2 x$

5. $f(x) = \left(x - \frac{1}{x}\right)^{\frac{3}{2}}$

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

6. $y = \sin^3 x + \cos^3 x$

$y' = 3\sin^2 x \cdot \cos x + 3\cos^2 x \cdot -\sin x$

$= 3\sin^2 x \cos x - 3\cos^2 x \sin x$

7. $y = \left(\frac{x-6}{x+7}\right)^3$ quotient Rule

$y' = 3\left(\frac{x-6}{x+7}\right)^2 \cdot \left(\frac{(x+7)(1) - (x-6)(1)}{(x+7)^2}\right)$

$= 3\frac{(x-6)^2}{(x+7)^2} \cdot \frac{13}{(x+7)^2} = \frac{39(x-6)^2}{(x+7)^4}$

8. $y = \sin^2(\cos(4x))$

$\frac{dy}{dx} = 2\sin(\cos(4x)) \cdot \cos(\cos(4x)) \cdot -\sin(4x) \cdot 4$

$= -8\sin(\cos(4x)) \cdot \cos(\cos(4x)) \cdot \sin(4x)$

9. $y = \frac{1}{\sqrt[5]{2x-1}} = (2x-1)^{-\frac{1}{5}}$

$\frac{dy}{dx} = -\frac{1}{5}(2x-1)^{-\frac{6}{5}} \cdot 2 = \frac{-2}{5(2x-1)^{6/5}}$

10. $y = \frac{\sin^2 x}{\cos x}$

$\frac{dy}{dx} = \frac{\cos x \cdot 2\sin x \cdot \cos x - \sin^2 x \cdot -\sin x}{\cos^2 x}$

$= \frac{2\sin x \cos^2 x + \sin^3 x}{\cos^2 x}$

11. $y = \sin^3(2x+3)$

$\frac{dy}{dx} = 3\sin^2(2x+3) \cdot \cos(2x+3) \cdot 2$

$= 6\sin^2(2x+3)\cos(2x+3)$

Ignore! ☺

Chain Rule Practice #2 Answers

1. $y' = 3\sec^2 3x$

2. $y' = 20\sec 5x \tan 5x$

3. $y' = -3x^2 \sin(x^3)$

4. $y' = -3\sin x \cos^2 x$

5. $f'(x) = -12\cos x \sin x(1+\cos^2 x)^5$

6. $y' = 2x\sec^2(x^2) + 2\tan x \sec^2 x$

7. $y' = -\sec^2 x \sin(\tan x)$

8. $y' = 3\sin^2 x \cos x - 3\cos^2 x \sin x$

9. $y' = -8\sin 4x \sin(\cos(4x))\cos(\cos 4x)$

10. $y' = \dfrac{2\sin x \cos^2 x + \sin^3 x}{\cos^2 x}$

11. $y' = 6\cos(2x+3)\sin^2(2x+3)$