4.1 day 2

Saturday, September 16, 2017 8:59 PM

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16. $y = x^3(2x-5)^4$

$u = x^3$ $\quad v = (2x-5)^4$

$du = 3x^2$ $\quad dv = 4(2x-5)^3 \cdot 2$

$= 8(2x-5)^3$

CHAIN RULE!

Now Product Rule!

$$\frac{dy}{dx} = x^3 \cdot 8(2x-5)^3 + (2x-5)^4 \cdot 3x^2$$

$$= x^2(2x-5)^3\left[8x + 3(2x-5)\right]$$

$$= x^2(2x-5)^3(14x-15)$$

17. $y = \sin^3 x \tan 4x$

$u = \sin^3 x$ $\quad v = \tan 4x$

$du = 3\sin^2 x \cdot \cos x$ $\quad dv = \sec^2 4x \cdot 4$

$= 4\sec^2 4x$

CHAIN RULE

Now Product Rule

$$\frac{dy}{dx} = \sin^3 x \cdot 4\sec^2 4x + \tan 4x \cdot 3\sin^2 x \cos x$$

$= 4\sin^2 x\left(\sin x \sec^2 4x + 3\tan 4x \cos x\right)$

20. $y = \dfrac{x}{\sqrt{1+x^2}}$

$u = x$ $\quad v = (1+x^2)^{1/2}$

$du = 1$ $\quad dv = \frac{1}{2}(1+x^2)^{-1/2}\cdot 2x$

$= x(1+x^2)^{-1/2}$ Chain Rule

Now Quotient Rule

$$\frac{dy}{dx} = \frac{(1+x^2)^{1/2}\cdot 1 - x\cdot x(1+x^2)^{-1/2}}{\left((1+x^2)^{1/2}\right)^2}$$

$$= \frac{(1+x^2)^{-1/2}\left[(1+x^2)^{2/2} - x^2\right]}{1+x^2}$$

$$= \frac{(1+x^2)^{-1/2}\left[1+x^2-x^2\right]}{1+x^2}$$

$$= (1+x^2)^{-3/2}$$

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

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

$du = \cos(3x-2)\cdot 3$

$\dfrac{dy}{dx} = 2u\cdot du$

$2\sin(3x-2)\cdot\cos(3x-2)\cdot 3$

$= 6\sin(3x-2)\cos(3x-2)$

22. $u = \sqrt{1+\tan 5x} = u^{1/2}$ $\quad du = \frac{1}{2}u^{-1/2}\cdot du$

24. $y = \sqrt{\tan 5x} = u^{1/2}$

$u = \tan 5x$

$du = 5\sec^2 5x$

$\frac{dy}{dx} = \frac{1}{2}u^{-1/2} \cdot du$

$= \frac{1}{2}(\tan 5x)^{-1/2} \cdot 5\sec^2 5x$

$= \frac{5}{2}\frac{\sec^2 5x}{\sqrt{\tan 5x}}$

29. $y = \tan x$

$y' = \sec^2 x$

$y'' = 2\sec x \cdot \sec x \tan x$

$= 2\sec^2 x \tan x$

30. $y = \cot x$

$y' = -\csc^2 x$

$y'' = -2\csc x \cdot -\csc x \cot x$

$= 2\csc^2 x \cdot \cot x$

31. $y = \cot(3x-1)$

$y' = -\csc^2(3x-1) \cdot 3$

$= -3\csc^2(3x-1)$

$y'' = -3 \cdot 2\csc(3x-1) \cdot -\csc(3x-1)\cot(3x-1) \cdot 3$

$= 18\csc^2(3x-1)\cot(3x-1)$

32 $y = 9\tan\left(\frac{x}{3}\right)$

$y' = 9\sec^2\left(\frac{x}{3}\right)\cdot\frac{1}{3}$

$= 3\sec^2\left(\frac{x}{3}\right)$

$y'' = 3\cdot 2u\cdot du$

$= 6\sec\left(\frac{x}{3}\right)\cdot\sec\left(\frac{x}{3}\right)\tan\left(\frac{x}{3}\right)$

$= 6\sec^2\left(\frac{x}{3}\right)\tan\left(\frac{x}{3}\right)$