$y' = vu' + uv'$ $y' = \frac{vu' - uv'}{v^2}$

Act 3.07

Tecnológico de Monterrey Preparatoria

Rules of Differentiation- Product & Quotient Rule practice

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Find the derivative of the following functions: BOX YOUR FINAL ANSWER

1) $f(x) = 4x^3(2x+5)^4$

$u' = 12x^2 \quad v' = 8(2x+5)^3$

$f'(x) = (2x+5)^4(12x^2) + (4x^3)[8(2x+5)^3]$

$f'(x) = 12x^2(2x+5)^4 + 32x^3(2x+5)^3$

$f'(x) = 4x^2(2x+5)^3[3(2x+5) + 8x]$

2) $f(x) = 2x\sqrt{(4x-2)^5}$ $(4x-2)^{5/2}$

$u' = 2 \quad v' = 5/2(4x-2)\cdot 4 \rightarrow 10(4x-2)^{3/2}$

$f'(x) = (4x-2)^{5/2}(2) + (2x)[10(4x-2)^{3/2}]$

$f'(x) = 2(4x-2)^{5/2} + 20x(4x-2)^{3/2}$

$f'(x) = 2(4x-2)^{3/2}[(4x-2) + 10x]$

3) $f(x) = (4x+1)^3(3-x^2)^4$

$u' = 3(4x+1)^2\cdot 4 \quad v' = 4(3-x^2)^3\cdot(-2x)$

$f'(x) = (3-x^2)^4(12(4x+1)^2) + (4x+1)^3(-8x(3-x^2)^3)$

$f'(x) = 12(3-x^2)^4(4x+1)^2 - 8x(3-x^2)^3(4x+1)^3$

$f'(x) = 4(3-x^2)^3(4x+1)^2[3(3-x^2) - 2x(4x+1)]$

4) $f(x) = x^3(x^2+1)^4$

$u' = 3x^2 \quad v' = 4(x^2+1)^3\cdot(2x) \rightarrow 8x(x^2+1)^3$

$f'(x) = (x^2+1)^4(3x^2) + (x^3)(8x(x^2+1)^3)$

$f'(x) = 3x^2(x^2+1)^4 + 8x^4(x^2+1)^3$

$f'(x) = x^2(x^2+1)^3[3(x^2+1) + 8x^2]$

5) $f(x) = (\frac{x}{2}+1)^8(x^2-3)^4$

$8(\frac{x}{2}+1)^7\cdot(\frac{1}{2})$

$4(\frac{x}{2}+1)^7$

$4(x^2-3)^3\cdot(2x)$

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

$f'(x) = (x^2-3)^4(4(\frac{x}{2}+1)^7) + (\frac{x}{2}+1)^8(8x(x^2-3)^3)$

$f'(x) = 4(x^2-3)^4(\frac{x}{2}+1)^7 + 8x(x^2-3)^3(\frac{x}{2}+1)^8$

$f'(x) = 4(x^2-3)^3(\frac{x}{2}+1)^7[(x^2-3) + 2x(\frac{x}{2}+1)]$

6) $f(x) = \frac{3x^2}{2}(2x-3)^4$ $u' = 3x \quad v' = 8(2x-3)^3$

$f'(x) = (2x-3)^4(3x) + (\frac{3}{2}x^2)(8(2x-3)^3)$

$f'(x) = 3x(2x-3)^4 + 12x^2(2x-3)^3$

$f'(x) = 3x(2x-3)^3[(2x-3) + 4x]$

7) $f(x) = \frac{(2x-1)^3}{2x^3}$ $v = 2x^{-3}$

$6(2x-1)^2$

$-6x^{-4}$

$f'(x) = (2x^{-3})(6(2x-1)^2) + (2x-1)^3(-6x^{-4})$

$f'(x) = 12x^{-3}(2x-1)^2 - 6x^{-4}(2x-1)^3$

$f'(x) = 6x^{-4}(2x-1)^2[2x - (2x-1)^3]$

8) $f(x) = \frac{2x^2}{(x^2+1)^5}$ $u' = 4x \quad v' = -10x(x^2+1)^{-6}$ $(x^2+1)^{-5}$

$f'(x) = (x^2+1)^{-5}(4x) + (2x^2)(-10x(x^2+1)^{-6})$

$f'(x) = 4x(x^2+1)^{-5} - 20x^3(x^2+1)^{-6}$

$f'(x) = 4x(x^2+1)^{-6}[(x^2+1) - 5x^2]$

$x+1)^{-2}$

9) $f(x)=\dfrac{8x}{x+1}$ u $v=(x+1)^{-1}$

$f'(x)=(x+1)^{-1}(8)+(8x)(-(x+1)^{-2})$

$f'(x)=8(x+1)^{-1}-8x(x+1)^{-2}$

$f'(x)=8(x+1)^{-2}[(x+1)-x]$

10) $f(x)=\dfrac{(2x-3)^4}{1-2x}$ u $u'=8(2x-3)^3$ $v'=2(1-2x)^{-2}$ $v=(1-2x)^{-1}$

$f'(x)=(1-2x)^{-1}(8(2x-3)^3)+(2x-3)^4(2(1-2x)^{-2})$

$f'(x)=8(1-2x)^{-1}(2x-3)^3+2(1-2x)^{-2}(2x-3)^4$

$f'(x)=2(1-2x)^{-2}(2x-3)^3[4(1-2x)+(2x-3)]$

$-x$

$0(2x+1)^{-6}$

11) $f(x)=-\dfrac{x^2}{(2x+1)^5}$ u $v=(2x+1)^{-5}$

$f'(x)=(2x+1)^{-5}(2x)+(x^2)(-10(2x+1)^{-6})$

$f'(x)=2x(2x+1)^{-5}-10x^2(2x+1)^{-6}$

$f'(x)=2x(2x+1)^{-6}[(2x+1)-5x]$

12) $f(x)=\dfrac{(x^3+1)^8}{(1-3x)^4}$ u $u'=24x^2(x^3+1)^7$ $v'=12(1-3x)^{-5}$ $v=(1-3x)^{-4}$

$f'(x)=(1-3x)^{-4}(24x^2(x^3+1)^7)+(x^3+1)^8(12(1-3x)^{-5})$

$f'(x)=24x^2(1-3x)^{-4}(x^3+1)^7+12(1-3x)^{-5}(x^3+1)^8$

$f'(x)=12(1-3x)^{-5}(x^3+1)^7[2x(1-3x)+(x^3+1)]$

13) Find the equation of tangent line to the given function at the indicated point:

$f(x)=\overset{u}{x}\overset{v}{(2x-3)^4}$ at $x=1$

$u'=1$ $v'=8(2x-3)^3$

$f'(x)=(2x-3)^4(1)+(x)(8(2x-3)^3)$

$f'(x)=(2x-3)^4+8x(2x-3)^3$

$f'(x)=(2x-3)^3[(2x-3)+8x]$

$m=(2(1)-3)^3[(2(1)-3)+8(1)]$

$m=(-1)^3[7]$

$m=-7$

$y=(1)(2(1)-3)^4$

$y=1(-1)^4$

$y=1$

$1=-7(1)+b$

$1=-7+b$

$b=8$

$y=-7x+8$

14) Find the equation of tangent line to the given function at the indicated point:

$f(x)=\dfrac{(2x-1)^5}{x}$ u $v=x^{-1}$ at $x=1$

$u'=10(2x-1)^4$ $v'=-x^{-2}$

$f'(x)=(x^{-1})(10(2x-1)^4)+(2x-1)^5(-x^{-2})$

$f'(x)=10x^{-1}(2x-1)^4-x^{-2}(2x-1)^5$

$f'(x)=x^{-2}(2x-1)^4[10x-(2x-1)]$

$m=(1)^{-2}(2(1)-1)^4[10(1)-(2(1)-1)]$

$m=(1)(1)[9]$

$m=9$

$y=(2(1)-1)^5(1)^{-1}$

$y=(1)(1)$

$y=1$

$1=9(1)+b$

$1=9+b$

$b=-8$

$y=9x-8$