Ex 2.6

#1 $y = x^2(2x+1)$

$\frac{dy}{dx} = 2x(2x+1) + (2)(x^2)$

$\frac{dy}{dx} = 4x^2 + 2x + 2x^2$

$\frac{dy}{dx} = 6x^2 + 2x$

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

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

$\frac{dy}{dx} = 8x^2 + 6x - 10 + 16x^2 + 6x$

$\frac{dy}{dx} = 24x^2 + 12x - 10$

#5. $y = (2x+3)(5x-4)$

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

$\frac{dy}{dx} = 10x - 8 + 10x + 15$

$\frac{dy}{dx} = 20x + 7$

#7, $y = (4x+7)(x^2-1)$

$\frac{dy}{dx} = (4)(x^2-1) + (2x)(4x+7)$

$\frac{dy}{dx} = 4x^2 - 4 + 8x^2 + 14x$

$\frac{dy}{dx} = 12x^2 + 14x - 4$

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RCET 264 INTRO CALC
HW #2 EX 2.6
#9, 11, 15, 21, & 23

Find derivative of each ~~function~~ Product.

#9. $y = (x^2+3x+4)(x^3-4x)$

$\frac{dy}{dx} = anx^{n-1}x'$

Derivative of a product is equal to the derivative of the first multiplied to the second (Product) then added to the first (product) multiplied to the derivative of the second.

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

$\frac{dy}{dx} = 2x^4-8x^2+3x^3-12x+3x^4+9x^3+12x^2-4x^2-12x-16$

$\frac{dy}{dx} = \cancel{2x^4+15x^3-16}$

$= \cancel{5x^4+12x^3-16}$

$\boxed{\frac{dy}{dx} = 5x^4+12x^3-24x-16}$

#11 $y = (x^4-3x^2-x)(2x^3-4x)$

$\frac{dy}{dx} = (4x^3-6x-1)(2x^3-4x) + (6x^2-4)(x^4-3x^2-x)$

$\frac{dy}{dx} = 8x^6-12x^4-2x^3-16x^4+24x^2+4x+6x^6-18x^4-6x^3$
$-4x^4+12x^2+4x$

$\frac{dy}{dx} = 6x^6+8x^6-50x^4-8x^3+36x^2+8x$

$\boxed{\frac{dy}{dx} = 14x^6-50x^4-8x^3+36x^2+8x}$

#15 $y = \dfrac{1}{x^2 + x}$

$\dfrac{dy}{dx} = anx^{n-1}$

The derivative of a quotient is solved by taking the derivative of the numerator and multiplying to the denominator. Then subtract the derivative of the denominator multiplied by the numerator. And finally dividing everything by the denominator squared.

$$\frac{dy}{dx} = \frac{0(x^2+x) - (2x+1)(1)}{(x^2+x)^2}$$

$$\boxed{\frac{dy}{dx} = \frac{-2x-1}{(x^2+x)^2}}$$

#21 $y = \dfrac{x-1}{x^2+x+1}$

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

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

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

$$\boxed{\frac{dy}{dx} = \frac{-x^2+2x+2}{(x^2+x+1)^2}}$$

#23. $y = \dfrac{4x^2+9}{3x^3-4x^2}$

$$\frac{dy}{dx} = \frac{(8x)(3x^3-4x^2) - (9x^2-8x)(4x^2+9)}{(3x^3-4x^2)^2}$$

$$\frac{dy}{dx} = \frac{(24x^4-32x^3) - (36x^4+81x^2-32x^3-72x)}{(3x^3-4x^2)^2}$$

$$\frac{dy}{dx} = \frac{24x^4-32x^3-36x^4-81x^2+32x^3+72x}{(3x^3-4x^2)^2}$$

$$\frac{dy}{dx} = \frac{-12x^4-81x^2+72x}{(3x^3-4x^2)^2}$$

#17. $y = \frac{3x-1}{2x+4}$

$$\frac{dy}{dx} = \frac{(3)(2x+4) - (2)(3x-1)}{(2x+4)^2}$$

$$\frac{dy}{dx} = \frac{(6x+12) - (6x-2)}{(2x+4)^2}$$

$$\frac{dy}{dx} = \frac{6x+12-6x+2}{(2x+4)^2}$$

$$\frac{dy}{dx} = \frac{14}{(2x+4)^2}$$

$$\frac{dy}{dx} = \frac{(2)(3x-1) - (3)(2x+4)}{(2x+4)^2}$$

$$\frac{dy}{dx} = \frac{6x-2-6x-12}{(2x+4)^2}$$

$$\frac{dy}{dx} = \frac{-14}{(2x+4)^2} \Rightarrow \frac{14}{2(2x+4)(2x+4)}$$

$$= \frac{14}{2 \cdot 2(x+2)(x+2)}$$

$$\frac{dy}{dx} = \frac{7}{2(x+2)^2}$$

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#19 $y = \frac{x^2}{2x+1}$

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

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

$$\frac{dy}{dx} = \frac{4x^2+2x-2x^2}{(2x+1)^2}$$

$$\frac{dy}{dx} = \frac{2x^2+2x}{(2x+1)^2}$$

$$\frac{dy}{dx} = \frac{2(x^2+x)}{(2x+1)^2}$$

#25 Find $f'(2)$ when $f(x) = (x^2-4x+3)(x^3-5x)$

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

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

$$\frac{dy}{dx} = (0)(-1) + (7)(-1)$$

$$\frac{dy}{dx} = -7 \quad f'(2)$$

#27 Find $f'(-1)$ when $f(x) = \frac{3x-4}{x+2}$

$$\frac{dy}{dx} = \frac{(3)(x+2) - (1)(3x-4)}{(x+2)^2}$$

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

$$f'(1) = 10$$

Ex 2.6

#29. Find the Slope of the Line to the Curve

$$y = \frac{x-3}{2-5x} \quad @ \quad (\underset{x}{2}, \underset{y}{\tfrac{1}{8}})$$

$$\frac{dy}{dx} = \frac{(1)(2-5x) - (-5)(x-3)}{(2-5x)^2}$$

$$m_{tan} = \frac{(2-5(2)) - (-5)(2-3)}{(2-5(2))^2}$$

$$m_{tan} = \frac{(2-10) - ((-5)(-1))}{(2-10)^2}$$

$$m_{tan} = \frac{(-8) - (5)}{(-8)^2}$$

$$m_{tan} = \frac{-13}{64}$$

#31 Find the Equation of the tangent Line to the Curve

$$y = \frac{x+3}{x-2} \quad @ x=3 \quad y=6$$

$$\frac{dy}{dx} = \frac{(1)(x-2) - (1)(x+3)}{(x-2)^2}$$

$$m_{tan} = \frac{(3-2) - (3+3)}{(3-2)^2} = \frac{1-6}{1} = \frac{-5}{1}$$

$$y - y_1 = m(x - x_1)$$

$$y - 6 = -5(x-3)$$

$$y = -5x + 15 + 6$$

$$y = -5x + 21$$

Ex 2.6.

#33: $V = Ir$ $\quad i = 6 + .02t^3$ $\quad t = 3$ sec $\quad r = 20 - .05t$ Ω

$V = (6 + .02t^3)(20 - .05t)$

$\frac{dv}{dt} = (.06t^2)(20 - .05t) + (.05)(6 + .02t^3)$

$\frac{dv}{dt} = 1.2t^2 - .003t^3 + .3 + .001t^3$

$\frac{dv}{dt} = -.002t^3 + 1.2t^2 + .3$

$\frac{dv}{dt} = -.002(3^3) + 1.2(3^2) + .3$

$\frac{dv}{dt} = -.054 + 10.8 + .3$

$\frac{dv}{dt} = 11.046$?

$V = (6 + .02t^3)(20 - .05t)$

$\frac{dv}{dt} = (.06t^2)(20 - .05t) + (.05)(6 + .02t^3)$

$\frac{dv}{dt} = (1.2t^2 - .003t^3) + (.3 + .001t^3)$

$\frac{dv}{dt} = 1.2(3^2) - .003(3^3) + .3 + .001(3^3)$

$\frac{dv}{dt} = 10.8 - .081 + .3 + .027$

$\frac{dv}{dt} = 11.046$?