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## 9.5: The product and quotient Rules

Ex1:  $\frac{d}{dx} (3x^4 - 2x^3 + 7)(x^3 + 2x^2 + 4x - 9)$

How could we tackle this?

### The product rule

If  $f(x) = u(x) \cdot v(x)$ , where  $u, v$  are differentiable fcts of  $x$ , then  $f'(x) = u'(x) \cdot v(x) + u(x) \cdot v'(x)$ .

Ex1 rev. What is  $u$  or what is  $v$ ?

Ex2: Find  $y'$  if  $y = (x+3)(x^2-2x)$

Ex3: Find  $\frac{ds}{dt}$  if  $s = (t^2+1)(t^3-1)$

Ex4: Differentiate, but do not simplify.

a)  $(7x^6 - 5x^4 + 2x^2 - 1)(4x^9 + 3x^7 - 5x^2 + 3x)$

b)  $(\sqrt[5]{x} - 2\sqrt[4]{x} + 1)(x^3 - 5x - 7)$

Ex5: Find the tangent line to

$y = (x^2+1)(x^3-4x)$  when  $x = -1$ .

Ex6: An agency will give tours for groups of at least 25. The cost is \$300/person for groups of 25. The cost is reduced by \$10 for each person over 25.

a) Find  $R(w)$

c) Find  $MR$

b) Find  $D_R$

d) Find & interpret  $MR(35)$ .

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Quotient Rule: If  $f(x) = \frac{u(x)}{v(x)}$ , where  $u, v$  are diff fcts of  $x$ , w/  $v(x) \neq 0$ , then  $f'(x)$  is

$$f'(x) = \frac{u'(x)v(x) - v'(x)u(x)}{[v(x)]^2}$$

Ex 7: If  $f(x) = \frac{x^3 + 2x}{x^2 - 7}$ , find  $f'$ .

Ex 8:  $\frac{d}{dx} \left( \frac{1 - 2x^2}{x^4 - 2x^2 + 5} \right)$ .

Ex 9: Write the tangent line to  $y = (4x^2 + 4x + 1)(7 - 2x)$  when  $x = 1$ .

Ex 10: Experimental evidence has shown that the concentration of injected adrenaline  $x$  is related to the response  $y$  of a muscle according to the eqn

$$y = \frac{x}{a + bx}$$

where  $a$  &  $b$  are constants. Find the RDC of response w/rt concentration.