W2 – The Product Rule Unit 1
MCV4U
Jensen

1) Use the product rule to differentiate each function

a) $f(x) = (5x + 2)(8x - 6)$

b) $h(t) = (-t + 4)(2t + 1)$

c) $p(x) = (-2x + 3)(x - 9)$

d) $g(x) = (x^2 + 2)(4x - 5)$

e) $f(x) = (1 - x)(x^2 - 5)$

f) $h(t) = (t^2 + 3)(3t^2 - 7)$

2) Determine $f'(-2)$ for each function.

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

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

3) Determine an equation for the tangent to each curve at the indicated value.

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

b) $h(x) = (x^4 + 4)(2x^2 - 6)$ at $x = -1$

4) Determine the point(s) on each curve that correspond to the given slope of the tangent.

a) $y = (-4x + 3)(x + 3),\ m = 0$

b) $y = (x^2 - 2)(2x + 1),\ m = -2$

5) Differentiate using the product rule.

a) $y = (5x^2 - x + 1)(x + 2)$

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

6) The owner of a local hair salon is planning to raise the price for a haircut and blow dry. The current rate is \$30 for this service, with the salon averaging 550 clients a month. A survey indicates that the salon will lose 5 clients for every incremental price increase of \$2.50.

a) Write an equation to model the salon's monthly revenue, R, in dollars, as a function of x, where x represents the number of \$2.50 increases in the price.

b) Use the product rule to determine $R'(x)$

c) Evaluate $R'(3)$ and interpret it for this situation.

d) Solve $R'(x) = 0$.

e) Explain how the owner can use the result of part d).

Answers:

1)a) $f'(x) = 80x - 14$ **b)** $h'(t) = -4t + 7$ **c)** $p'(x) = -4x + 21$ **d)** $g'(x) = 12x^2 - 10x + 8$
e) $f'(x) = -3x^2 + 2x + 5$ **f)** $h'(t) = 12t^3 + 4t$
2)a) 54 **b)** 60
3)a) $y = -240x - 739$ **b)** $y = -4x - 24$
4)a) $\left(-\frac{9}{8}, \frac{225}{16}\right)$ **b)** $(0.43, -3.38)$ and $(-0.77, 0.76)$
5)a) $15x^2 + 18x - 1$ **b)** $-24x^5 + 5x^4 - 32x^3 - 30x^2 + 6x$
6)a) $R(x) = (30 + 2.50x)(550 - 5x)$ **b)** $R'(x) = 1225 - 25x$ **c)** 1150; this is the rate of change of revenue at a $7.50 increase **d)** $x = 49$ **e)** The owner could maximize the revenue by making 49 increases of $2.50. A visit to the hair salon would cost $152.50 and would generate a max revenue of $46 512.50.