Section 4.1 Continued

Derivative of a Constant Times a Function:

DERIVATIVE OF A CONSTANT TIMES A FUNCTION: Let k be any real number. If $g'(x)$ exists, then we have

$$\frac{d}{dx}\left[k \cdot g(x)\right] = k \cdot g'(x).$$

Examples:

1. Calculate the derivatives of the following functions

   (a) $f(x) = -4x^2$

   (b) $f(x) = -2x^{-3}$

   (c) $f(x) = 7x$

The Derivative of Sums and Differences:

SUM OR DIFFERENCE RULE: If $u(x)$ and $v(x)$ both have derivatives, then

$$\frac{d}{dx}\left[u(x) \pm v(x)\right] = u'(x) \pm v'(x).$$

Examples:

2. Find the derivatives of the following functions.

(a) $y = 2x^4 + 2 + \dfrac{1}{2x^4}$

(b) $y = 4\sqrt{x} + \dfrac{4}{\sqrt{x}} + \sqrt[4]{x}4$

(c) $y = \sqrt{x}\left(x^2 - \dfrac{1}{x^2}\right)$

3. Let $f(x) = -2x^3 + 6x + 8$

   (a) Find the equation of the tangent line when $x = -2$.

   (b) Find the x-values where the tangent line to the curve is horizontal.

4. Assume that a demand equation is given by $q = 500 - 100p$, and the cost of producing q units is given by $C(q) = 3000 - 20q + 0.03q^2$.

   (a) Find the revenue function, $R(q)$.

   (b) Find the marginal profit function, $P'(q)$.