2.2 Derivatives of Polynomial Functions

The Constant Function Rule

If f(x) = k, where k is a constant, then f'(x) = 0. In Leibniz notation:

The Power Rule

If $f(x) = x^n$, where n is a real number, then $f'(x) = nx^{n-1}$. In Leibniz notation:

Example 1: Apply the power rule

a) $f(x) = x^7$

b) $g(t) = t^{3/2}$

c) $g(x) = 1/x^3$

d) $\frac{d}{dx}(x)$

The Constant Multiple Rule

If f(x) = kg(x), where k is a constant, then f'(x) = kg'(x). In Leibniz notation:

Example 2: Differentiate the following functions:

a) $f(x) = 7x^3$

b) $y = 12x^{4/3}$

The Sum Rule

If functions p(x) and q(x) are differentiable, and f(x) = p(x) + q(x), then f'(x) = p'(x) + q'(x).
In Leibniz notation:

The Difference Rule

If functions p(x) and q(x) are differentiable, and f(x) = p(x) – q(x), then f'(x) = p'(x) – q'(x).
In Leibniz notation:

Example 3: Differentiate the following functions:

a) $f(x) = 3x^2 - 5\sqrt{x}$

b) $y = (3x + 2)^2$

Example 4: Determine the equation of the tangent to the graph of $f(x) = -x^3 + 3x^2 - 2$ at x = 1.

Example 5: Determine points on the graph in Example 4 where the tangents are horizontal.