Section 3.2 Derivatives of Polynomials and Exponential Functions

The Product and Quotient Rules

Ex: Prove the Product Rule: $f(x) = u(x)v(x) \Rightarrow f'(x) = \dfrac{du}{dx}v(x) + u(x)\dfrac{dv}{dx}$

Ex: Find the derivative of the following functions

a) $f(x) = (3x^2 + 5)(7x - 2)$

b) $f(x) = (5x^3 - 5x^2 + 7x - 3)e^x$

Ex: If $f(x) = \sqrt{x}g(x)$, where $g(4) = 2$ and $g'(4) = 3$, find $f'(4)$

Ex: Using product rule to differentiate $f(x) = h(x)g(x)k(x)$

Prove the Quotient Rule: $f(x) = \dfrac{u(x)}{v(x)} \Rightarrow f'(x) = \dfrac{u'(x)v(x) - v'(x)u(x)}{(v(x))^2}$

Ex: Find the derivative of the following functions:

a) $f(x) = \dfrac{4x^3 + 2x}{x^2 + 5}$

b) $f(x) = \dfrac{(5x^2 - 7x)e^x}{x^3 + 1}$

Ex: Find equation of tangent line to the function: $f(x) = \dfrac{3x^3 + 1}{x^2 + x - 3}$ at $x = 1$

Ex: Find the equation of the tangent lines to the curve $y = \dfrac{x-1}{x+1}$ that are parallel to the line $x - 2y = 1$

Ex: Find equation of the tangent line to the following curves at given points.

a) $y = \dfrac{1}{1+x^2}$ at $\left(-1, \dfrac{1}{2}\right)$

b) $y = \dfrac{x}{1+x^2}$ at $\left(3, \dfrac{1}{3}\right)$