The Chain Rule & Advanced Techniques Questions

The Chain Rule

Second Derivatives

Exponential & Logarithmic Functions

Implicit Differentiation

The Chain Rule

Q1) Use the chain rule to find the derivative of the following functions.

a) $f(x) = (x+4)^3$

b) $f(x) = 3(x+1)^5$

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

d) $f(x) = 4(x+2)^{-2}$

Q2) Use the chain rule to find the derivative of the following functions.

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

b) $y = 2(2x-5)^6$

c) $f(x) = (4x-3)^{-2}$

d) $g(x) = 2(1-3x)^2$

Q3) Use the chain rule to find the derivative of the following functions.

a) $f(x) = (4x-4)^{\frac{1}{2}}$

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

c) $g(x) = \sqrt{(2-4x)^3}$

d) $h(x) = \sqrt[4]{(\frac{1}{2}x^2-5)^3}$

Second Derivatives

Q1) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for the following functions.

a) $y = 12x^2 + 3x + 8$

b) $y = 15x + 6 + \frac{3}{x}$

c) $y = 9\sqrt{x} - \frac{3}{x^2}$

d) $y = (5x+4)(3x-2)$

Exponential & Logarithmic Functions

Q1) Find the derivative of each of the following functions.

a) $y = 4e^{7x}$

b) $y = e^{-3x-x^2}$

c) $y = e^{1-x}$

d) $y = e^{3x} - e^{-3x}$

e) $y = e^{\sqrt{x}}$

f) $y = e^{-x^2}$

Q2) Find the derivative of each of the following functions.

a) $y = \ln(2x)$

b) $y = \ln(x^3)$

c) $y = \ln(5x - 2x^2)$

d) $y = \ln(\frac{1}{x})$

Q3) Find the derivative of each of the following functions.

a) $y = \ln(e^{x^2})$

b) $y = \ln(3 + e^{2x})$

Implicit Differentiation

Q1) Find an expression in terms of x and y for $\frac{dy}{dx}$ given that:

a) $x^2 + y^3 = 2$

b) $x^2 + 5y^2 = 14$

c) $y^3 + 3x^2y - 4x = 0$

d) $(x-y)^4 = x + y + 5$

e) $e^x y = xe^y$

f) $\sqrt{xy} + x + y^2 = 0$