Differentiation Techniques

Questions

The Power Rule

The Product & Quotient Rule

Differentiating Trig Functions

The Power Rule

Q1) Use the power rule to differentiate the following functions with respect to x.

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

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

c) $y = 5x^{-2}$

d) $f(x) = x^{\frac{1}{3}}$

e) $f(x) = \frac{x^4}{4}$

f) $y = \frac{1}{2}x^{\frac{2}{3}}$

Q2) Use the power rule to differentiate the following functions with respect to x.

a) $y = x^2 + 4$

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

c) $f(x) = \frac{1}{2}x^{-6} - 3x^2$

d) $y = x^4 + 3x^{-3}$

e) $y = 2x^2 + 5x^2$

f) $h(x) = \frac{1}{3}x^{-3}$

Q3) Rewrite the following functions in a differentiable form and then differentiate with respect to x.

a) $f(x) = \frac{1}{x^3}$

b) $y = \frac{x^2+4}{3}$

c) $y = 12\sqrt[3]{x}$

d) $y = x^{\frac{-3}{4}}$

e) $g(x) = \sqrt[4]{x}$

f) $f(x) = 3\sqrt{x^3}$

The Product & Quotient Rule

Q1) Use the product rule to differentiate the following functions with respect to x.

a) $\mathrm{f}(x) = x(2x^2 + 3)$

b) $\mathrm{f}(x) = x^3(4 - 4x)$

c) $\mathrm{f}(x) = (3x + 5)(x^4 - 2)$

d) $y = \frac{1}{x^2}(x^3 + 3x)$

e) $\mathrm{y} = x^{-3}(2x^4 + 7)$

f) $\mathrm{y} = x^{-\frac{1}{2}}(5 - 4x^{-3})$

Q2) Use the quotient rule to differentiate the following functions with respect to x.

a) $f(x) = \frac{4x}{2x^3}$

b) $y = \frac{7x}{3x + 1}$

c) $y = \frac{x^2}{5 - 4x}$

d) $f(x) = \frac{x^2 - 5x}{x^3}$

e) $f(x) = \frac{2x^3 + 4}{x^2 - 3}$

f) $y = \frac{x^{-2} - 7}{x^{-3}}$

Differentiating Trig Functions

Q1) Find the derivative of the following trigonometric functions.

a) $f(x) = 5 \sin x$

b) $f(x) = 3 \sin 2x$

c) $f(x) = 4 \cos x$

d) $f(x) = -2 \cos(3x)$

e) $f(x) = \frac{1}{2} \cos 6x$

f) $f(x) = -3 \sin 2x$

g) $f(x) = \frac{1}{3} \cos 9x$

h) $f(x) = -4 \sin \frac{x}{4}$