

Differentiation

Please simplify your answers whenever possible.

Question 1 Calculate the derivatives of the given functions.

a $y = 3x^2 - 5x - 7$

b $y = 3 \cdot \sqrt[3]{t^2} - \frac{2}{\sqrt{t^3}}$

c $f(x) = \frac{3-4x}{3+4x}$

d $f(x) = \frac{ax+b}{cx+d}$

Question 2 Calculate the derivative of the function $f(x) = x^3$ using directly the definition of derivative.

Question 3 Calculate the derivatives of the given functions by using the chain rule.

a $f(x) = (2x + 3)^6$

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

Question 4 Calculate $\frac{d}{dx}(3e^{5x^2+7})$

Question 5 Calculate $\frac{d}{dx}(x \cdot \ln x)$

Question 6 Find the slope of the tangent line to the graph of $y = x^2 - 3$ at $x = 1.5$.

Question 7 Find the derivative of $f(x)$.

a $f(x) = \frac{1}{\sqrt[5]{x}}$

b $f(x) = x^5 + e^{3x} - \ln x$

c $f(x) = (3x^2 + 5)(e^{5x} - x^5)$ (Using the product rule)

d $f(x) = (x^2 - \ln x)^3$ (Using the chain rule)

e $f(x) = \sqrt{25 - x^2}$

f $f(x) = e^{x^2} - 7e^{7x}$

Question 8 If $f(x) = x^3 + \frac{1}{x}$, what is $\frac{d^2}{dx^2}f(x)$?