

1. Differentiate the following functions:

a) $f(x) = \sin^3(2x^2 + 1)e^{\sqrt{4x+5}}$

b) $f(x) = \sin^{-1}\left(\frac{\sqrt[5]{x^3 + 3x^2 - 1}}{\sec(3x + 1)}\right)$

2. Determine $\frac{dy}{dx}$ of the expression $\cos^3(2x^3 + y^2) + e^{x^2 y^3} = 4$

3. Integrate the following:

a) $\int (2 + \sqrt{x})^{12} dx$

b) $\int \frac{7x-2}{\sqrt[3]{3x-1}} dx$

c) $\int \frac{x}{\sqrt{2 + \sqrt{3x^2 + 1}}} dx$

d) $\int x^8 \sqrt[5]{2x^3 - 1} dx$

e) $\int_0^{\frac{1}{3}} \frac{(\tan^{-1}(3x))^4}{1+9x^2} dx$

f) $\int \frac{1}{x \ln x [\ln(\ln x)]^3} dx$