

Chain Rule

1. Differentiate the following functions;

(a) $y = \sin(3x)$

(b) $y = \cos(x^2)$

(c) $y = \ln(3x + 5)$

(d) $f(x) = e^{(x^3)}$

(e) $f(x) = (3x^2 + 5x)^4$

(f) $y = \sin(x^3 + 7)$

(g) $f(x) = e^{\sin x}$

(h) $f(x) = \ln(x^2 + 2x)$

(i) $y = \sqrt{x^3 + x}$

(j) $y = \sin^2 x$

(k) $y = \cos(6x - 7)$

(l) $y = \frac{1}{\sqrt{2x^3 - 3}}$

(m) $f(x) = (3x + 2)^7$

(n) $f(x) = \cos^3 x$

(o) $y = e^{x^4 + x^3}$

(p) $y = \ln(\cos x)$

(q) $y = \sin(\sqrt{x})$

2. Differentiate the following functions, which contain combinations of chain, product and quotient rules;

(a) $y = x^3 \sin(3x)$

(b) $y = 2x \cos(x^2)$

(c) $y = (3x + 2)(4x - 7)^3$

(d) $y = x^3 e^{x^2}$

(e) $y = 5x \ln(x + 2)$

(f) $y = \frac{e^x}{x^2}$

(g) $f(x) = \sqrt{\frac{x+1}{x-1}}$

(h) $f(x) = \sin^2(5x)$

(i) $f(x) = \cos^3(9x + 4)$

(j) $f(x) = e^{\sin^2 x}$

(k) $y = \ln\left(\frac{x-1}{x+1}\right)$

(l) $y = x^4 \cos^2(7x^3)$

(m) $y = e^{\sin^3(5x)}$