

1. Use the definition of the derivative as a limit to determine  $f'(x)$  in each case:

(a)  $f(x) = \sqrt{2-3x}$

(b)  $f(x) = \sqrt{4x+1}$

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

(d)  $f(x) = 3x^2 - 4x + 1$

(e)  $f(x) = \frac{1-x}{2x+1}$

(f)  $f(x) = \frac{3-4x}{5x+4}$

(g)  $f(x) = \frac{1}{\sqrt{3x-4}}$

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

2. Differentiate each of the following functions:

(i)  $f(x) = 4x^7 - \frac{3}{x} + \sqrt{x}$

(ii)  $f(x) = 5x^{3/4} - 2x^{5/3} + x^{1/5}$

(iii)  $f(x) = (x^4 - 2x^3)(x^{2/3} + x + 1)$

(iv)  $f(x) = (2x^{3/4} - x^3)(x^{1/2} - 4x^{2/3})(5x^6 - 3x^3 + 7x^2)$

(v)  $f(x) = \frac{(5x^7 - 4x^3 + 1)}{(2x^{1/2} - x + 1)}$

(vi)  $f(x) = \frac{(2x^3 - x^2 + 1)(4x^5 - x^2)}{(2x^6 - x^3 + 1)}$

(vii)  $f(x) = \frac{(x^{1/2} + 1)(x^{2/3} - x^{3/4})}{(x+1)(3x^3 - 7x^2 + 1)}$