Access to Science, Engineering and Agriculture: Mathematics 1
MATH00030
Chapter 6 Exercises

1. Find the derivatives of the following functions using first principles.

   (a) $f(x) = 4x$.
   (b) $f(x) = 5x^2$.
   (c) $f(x) = -3x + 2$.
   (d) $f(x) = 4x^2 - 5$.
   (e) $f(x) = -x^2 + 2x + 3$.

2. Find the derivatives of the following functions.
   Note that these can be done just using Table 1 of Chapter 6 of the course notes.

   (a) $f(x) = 5$
   (b) $f(x) = -\pi \cos(e)$
   (c) $f(x) = x^2$
   (d) $f(x) = x^{\frac{9}{2}}$
   (e) $f(x) = x^{-5}$
   (f) $f(x) = x^{\cos(2)}$
   (g) $f(x) = e^{4x}$
   (h) $f(x) = e^{\frac{3}{2}x}$
   (i) $f(x) = e^{-6x}$
   (j) $f(x) = e^{\pi x}$
   (k) $f(x) = \ln(4x)$ (where $x > 0$).
   (l) $f(x) = \ln(-\pi x)$ (where $x < 0$).
   (m) $f(x) = \ln\left(\frac{1}{2}x\right)$ (where $x > 0$).
   (n) $f(x) = \sin(2x)$
   (o) $f(x) = \sin(-2x)$
   (p) $f(x) = \sin(ex)$
   (q) $f(x) = \cos(3x)$
   (r) $f(x) = \cos(-3x)$
   (s) $f(x) = \cos(-\pi x)$

3. Find the derivatives of the following functions.
Note that these can be done using Table 1 of Chapter 6 of the course notes together with the Sum and Multiple Rules.

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

(b) $f(x) = -x^{-1} + 2\sin 4x$

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

(d) $f(x) = 2\ln(-x) + 4\cos(-3x) - e^{-\frac{3}{2}x}$ (where $x < 0$).

(e) $f(x) = -2x^2 + 3\ln(3x) + e^{\cos(1)x}$ (where $x > 0$).

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

(g) $f(x) = e^2 + e^{2x} - 4$

(h) $f(x) = -3x^{-3} + 4x^4 + 5x^{-5} + 3x^0$