11 ☙ Derivatives

1 Find the derivative of the function $f(x) = x^3 - x$ at $x = -1$ by directly calculating the limit $f'(-1) = \lim\limits_{h \to 0} \dfrac{f(-1+h) - f(-1)}{h}$.

$f'(-1) =$

2 For the following functions, use the definition of derivative $f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ to calculate the derivative of each function.

a) $f(x) = -2x + 1$

$f'(x) =$

b) $f(x) = 2x^2 + 5$

$f'(x) =$

c) $f(x) = (1 - 2x)^2$

$f'(x) =$

3 For the following polynomial functions, find the derivatives.

a) $f(x) = -3x^2 - 7x + 6$.

b) $f(x) = 3x^3 + 2x^2 + x - 26$.

c) $f(x) = (x - 1)(x^2 + x + 1)$.

4 The revenue generated by selling x items is given by $R(x) = 2x^2 + 10x$.

a) Find the average change of the revenue function as x changes from $x = 10$ to $x = 20$.

b) Find $R'(10)$.

c) Find $R'(15)$, and show that it coincides with the answer of a).