

## 2.2 Exercises

### Exercise 2.1

For each of the following functions,

$$\begin{array}{lll} \text{a) } f(x) = 3x + 1 & \text{b) } f(x) = x^2 - x & \text{c) } f(x) = \sqrt{x^2 - 9} \\ \text{d) } f(x) = \frac{1}{x} & \text{e) } f(x) = \frac{x-5}{x+2} & \text{f) } f(x) = -x^3 \end{array}$$

calculate the function values

$$\begin{array}{lllll} \text{i) } f(3) & \text{ii) } f(5) & \text{iii) } f(-2) & \text{iv) } f(0) & \text{v) } f(\sqrt{13}) \\ \text{vi) } f(\sqrt{2} + 3) & \text{vii) } f(-x) & \text{viii) } f(x + 2) & \text{ix) } f(x) + h & \text{x) } f(x + h) \end{array}$$

### Exercise 2.2

Let  $f$  be the piecewise defined function

$$f(x) = \begin{cases} x - 5 & , \text{ for } -4 < x < 3 \\ x^2 & , \text{ for } 3 \leq x \leq 6 \end{cases}$$

a) State the domain of the function.

Find the function values

$$\begin{array}{llll} \text{b) } f(2) & \text{c) } f(5) & \text{d) } f(-3) & \text{e) } f(3) \end{array}$$

### Exercise 2.3

Let  $f$  be the piecewise defined function

$$f(x) = \begin{cases} |x| - x^2 & , \text{ for } x < 2 \\ 7 & , \text{ for } 2 \leq x < 5 \\ x^2 - 4x + 1 & , \text{ for } 5 < x \end{cases}$$

a) State the domain of the function.

Find the function values

$$\begin{array}{lll} \text{b) } f(1) & \text{c) } f(-2) & \text{d) } f(3) \\ \text{e) } f(2) & \text{f) } f(5) & \text{g) } f(7) \end{array}$$

**Exercise 2.4**

Find the difference quotient  $\frac{f(x+h)-f(x)}{h}$  for the following functions:

- a)  $f(x) = 5x$                       b)  $f(x) = 2x - 6$                       c)  $f(x) = x^2$   
d)  $f(x) = x^2 + 5x$                       e)  $f(x) = x^2 - 7$                       f)  $f(x) = x^2 + 3x + 4$   
g)  $f(x) = x^2 + 4x - 9$                       h)  $f(x) = 3x^2 - 2x$                       i)  $f(x) = 4x^2 + 6x$   
j)  $f(x) = 2x^2 - 8x - 3$                       k)  $f(x) = -5x^2 + 3$                       l)  $f(x) = x^3$

**Exercise 2.5**

Find the difference quotient  $\frac{f(x)-f(a)}{x-a}$  for the following functions:

- a)  $f(x) = 3x$                       b)  $f(x) = 4x - 7$                       c)  $f(x) = x^2 - 3x$   
d)  $f(x) = x^2 + 4x - 5$                       e)  $f(x) = 7x^2 + 2x$                       f)  $f(x) = \frac{1}{x}$

**Exercise 2.6**

Find the domains of the following functions.

- a)  $f(x) = x^2 + 3x + 5$                       b)  $f(x) = |x - 2|$                       c)  $f(x) = \sqrt{x - 2}$   
d)  $f(x) = \sqrt{8 - 2x}$                       e)  $f(x) = \sqrt{|x + 3|}$                       f)  $f(x) = \frac{1}{x+6}$   
g)  $f(x) = \frac{x-5}{x-7}$                       h)  $f(x) = \frac{x+1}{x^2-7x+10}$                       i)  $f(x) = \frac{x}{|x-2|}$   
j)  $f(x) = \begin{cases} |x| & \text{for } 1 < x < 2 \\ 2x & \text{for } 3 \leq x \end{cases}$                       k)  $f(x) = \frac{\sqrt{x}}{x-9}$                       l)  $f(x) = \frac{5}{\sqrt{x+4}}$