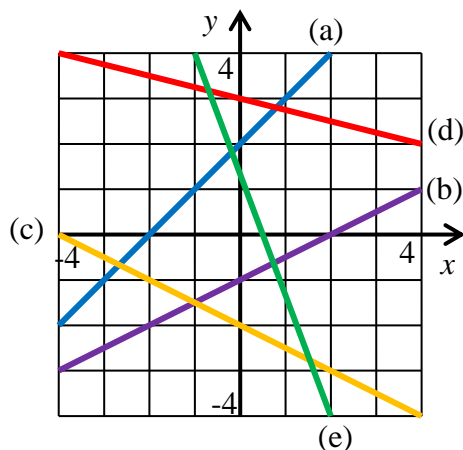## Section 2: Graphs of functions

Exercise

1. For each of the functions below, sketch the graph of $y = f(x)$, and state the range of the function.
   (i) $f(x) = 1 - 3x$ where x can take any value
   (ii) $f(x) = 1 - 3x$ where $x > 0$
   (iii) $f(x) = x^2$ where x can take any value
   (iv) $f(x) = x^2 + 1$ where x can take any value
   (v) $f(x) = x^2 + 1$ where $x > 1$

2. Sketch the graphs of the following functions:
   (i) $f(x) = x^2 + 6x + 8$
   (ii) $f(x) = 4 - x^2$

3. A function is defined as $f(x) = \dfrac{1}{1+x^2}$ where $-1 \le x \le 1$
   (i)   Find f(-1) and f($\frac{1}{2}$).
   (ii) State the range of the function.

4. The function is defined as:
   $$f(x) = \frac{1}{x-1}.$$
   (i)   What value of x must be excluded from the domain of this function?
   (ii) Find   (a) f(2)   (b) f(− 3)   (c) f(0)
   For what value of x is $f(x) = 2$?

5. Sketch the following lines.
    (i) $y = x + 3$ (ii) $y = 2x - 1$ (iii) $x + y = 5$
    (iv) $4y = x + 12$ (v) $3y + x + 6 = 0$ (vi) $5y = 15 - 2x$

6. Find the equations of the lines (a)-(e) in the diagram below.

7. Find the equations of the following lines.
   (i)   With gradient 4 and passing through (2, 3)
   (ii) With gradient $-\frac{1}{3}$ and passing through (4, -1)
   (iii) With gradient $-\frac{1}{5}$ and passing through (-1, -6)

8. Find the equation of the line AB in each of the following cases.
   (i)   A(1, 6), B(3, 2)   (ii) A(8, -1), B(-2, 3)
   (iii) A(-5, 2), B(7, -4)   (iv) A(-3, -5), B(5, 1)

9. The sides of a triangle are formed by parts of the lines $y + 3x = 11$, $3y = x + 3$ and $7y + x = 37$. Find the coordinates of the vertices of the triangle.

10. A function is defined as
$$\mathrm{f}(x) = 2x \qquad 0 \le x < 2$$
$$= 4 \qquad 2 \le x < 3$$
$$= 7 - x \quad 3 \le x \le 7$$
Sketch the graph of $y = \mathrm{f}(x)$.

11. A function is defined as $\mathrm{f}(x) = 3x^2 - x$.

Find an expression for $\dfrac{\mathrm{f}(x + h) - \mathrm{f}(x)}{h}$.

12. The domain of f(x) is any value of x. The range of f(x) is f(x) ≥ 2.

Find a possible formula for f(x).