$$f(x) = (x + 3)(x + 2)(x - 1)$$

(a) Sketch the curve $y = f(x)$, showing the points of intersection with the coordinate axis. **(3)**

(b) Showing the coordinates of the points of intersection with the coordinate axis, sketch on separate diagrams the curves

(i) $y = f(x - 3)$ **(2)**

(ii) $y = f(-x)$ **(2)**

$$f(x) = x^3 + 4x^2 - 5x$$

(a) Sketch the curve $y = f(x)$, showing the points of intersection with the coordinate axis. **(3)**

(b) Showing the coordinates of the points of intersection with the coordinate axis, sketch on separate diagrams the curves

(2)

(i) $y = f(x + 1)$

(2)

(ii) $y = f(2x)$

Sketch graph of $y = \frac{1}{x} + 2$, showing the points of intersection with the coordinate axis and stating the equations of any asymptotes.

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

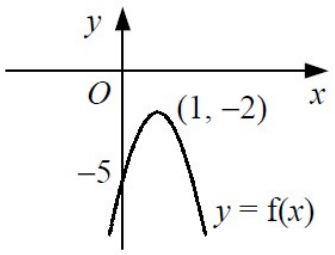
(a) Sketch the curve $y = f(x)$, showing the points of intersection with the coordinate axis. **(3)**

(b) Find the equation of $y = f(x + 2)$ in the form $y = (x + a)(x + b)^2$ **(2)**

Given that the constants p and q are such that $p > q > 0$, sketch each of the following graphs showing the coordinates of any points of intersection with the coordinate axes.

a $y = (x - p)(x - q)^2$

b $y = (x - p)(x^2 - q^2)$



The diagram shows the curve with equation $y = f(x)$ which has a turning point at $(1, -2)$ and crosses the y-axis at the point $(0, -5)$.

Given that $f(x)$ is a quadratic function, find an expression for $f(x)$.

a Find the coordinates of the points where the straight line $y = x + 6$ meets the curve $y = x^3 - 4x^2 + x + 6$.

b Given that

$$x^3 - 4x^2 + x + 6 \equiv (x + 1)(x - 2)(x - 3),$$

sketch the straight line $y = x + 6$ and the curve $y = x^3 - 4x^2 + x + 6$ on the same diagram, showing the coordinates of the points where the curve crosses the coordinate axes.

Find the set of values of the constant a for which the line $y = 2 - 5x$ intersects the curve $y = x^2 + ax + 18$ at two points.

(a) Sketch on the same diagram the curves $y = x^2 + 5x$ and $y = -\frac{1}{x}$ **(4)**

(b) State, giving a reason, the number of real solutions to the equation $x^2 + 5x + \frac{1}{x} = 0$ **(2)**

a Find the coordinates of the turning point of the curve $y = x^2 + 2x - 3$.

b By sketching two suitable graphs on the same set of axes, show that the equation

$$x^2 + 2x - 3 - \frac{1}{x} = 0$$

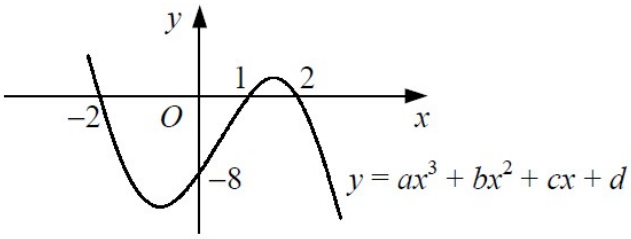
has one positive and two negative real roots.

a Find the coordinates of the points where the straight line $y = x + 6$ meets the curve $y = x^3 - 4x^2 + x + 6$.

b Given that

$$x^3 - 4x^2 + x + 6 \equiv (x + 1)(x - 2)(x - 3),$$

sketch the straight line $y = x + 6$ and the curve $y = x^3 - 4x^2 + x + 6$ on the same diagram, showing the coordinates of the points where the curve crosses the coordinate axes.



The diagram shows the curve with equation $y = ax^3 + bx^2 + cx + d$.

Given that the curve crosses the y-axis at the point $(0, -8)$ and crosses the x-axis at the points $(-2, 0)$, $(1, 0)$ and $(2, 0)$, find the values of the constants a, b, c and d.