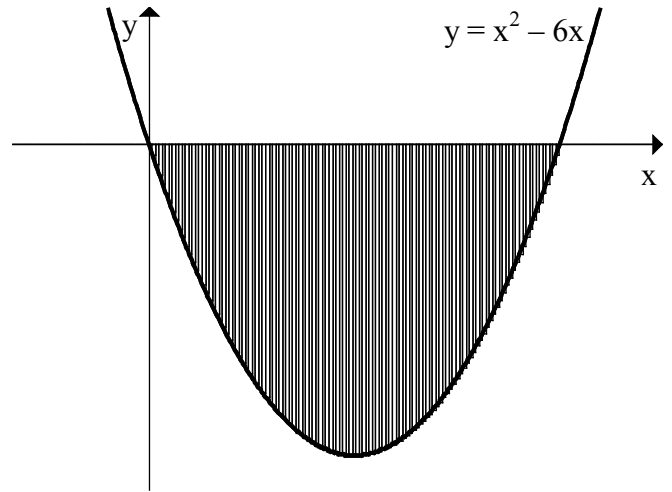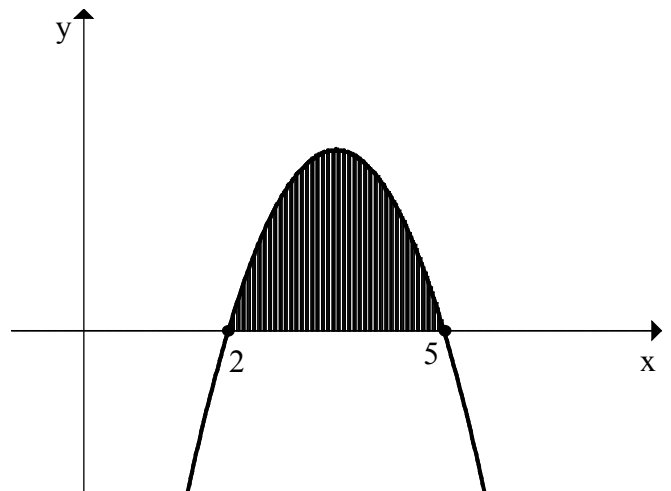# Integration

1. Calculate (a) $\int x^2(x-5)\ dx$ (b) $\int_1^4 \frac{x^2+3}{\sqrt{x}}\ dx$ (c) $\int_{-1}^2 \left(\frac{x}{2} + \frac{2}{x}\right)^2 dx$
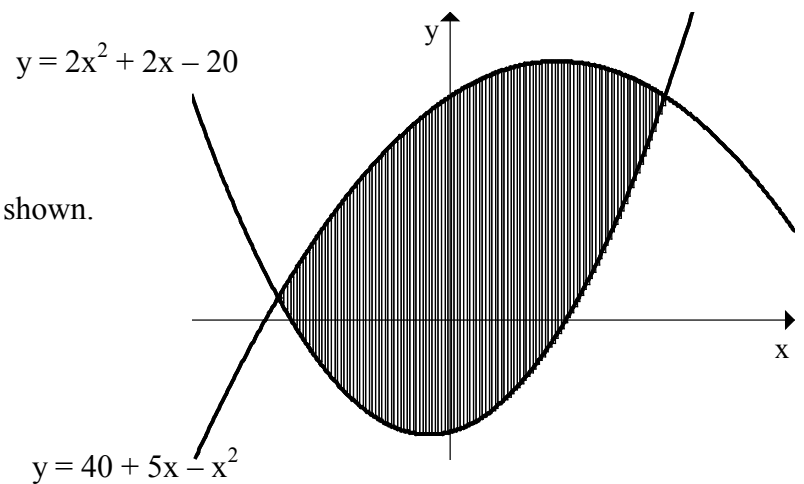
2. Calculate the shaded area in the diagram opposite.

$y = x^2 - 6x$

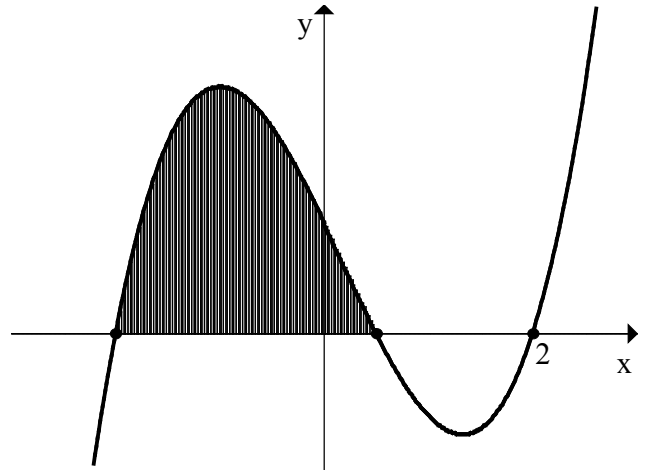3. The diagram shows part of the graph of $y = 7x - 10 - x^2$.
   Calculate the shaded area.

4. Find the area between the curves shown.
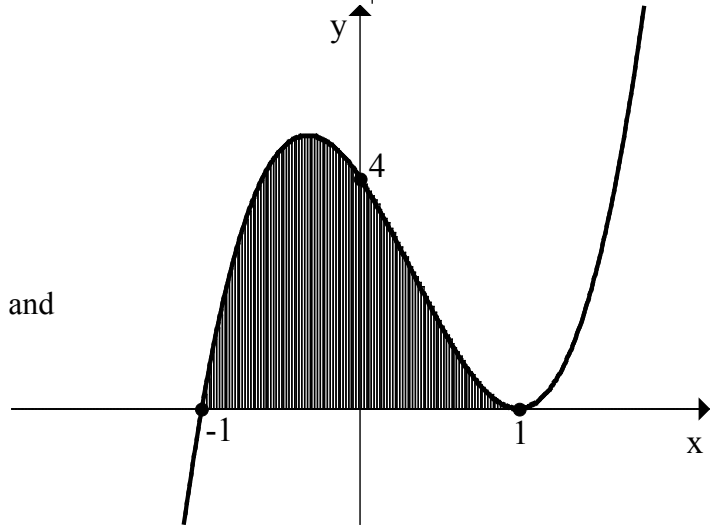
$y = 2x^2 + 2x - 20$

$y = 40 + 5x - x^2$

5. The diagram opposite illustrates the graph
   of y = f(x) where $f(x) = 2x^3 - x^2 - 8x + 4$.

   (a) Show that x – 2 is a factor of f(x) and
       hence fully factorise f(x).
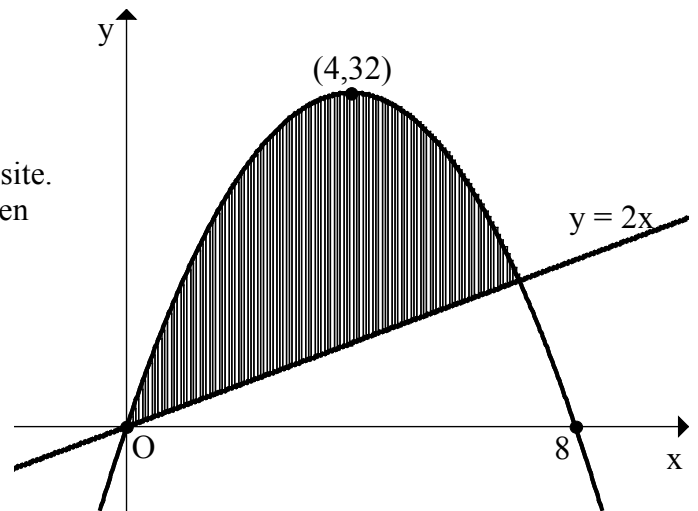   (b) Calculate the shaded area.

6. The diagram shows part of y = f(x).

   (a) Find a formula for f(x).
   (b) Calculate the area enclosed by f(x) and
       the x-axis.
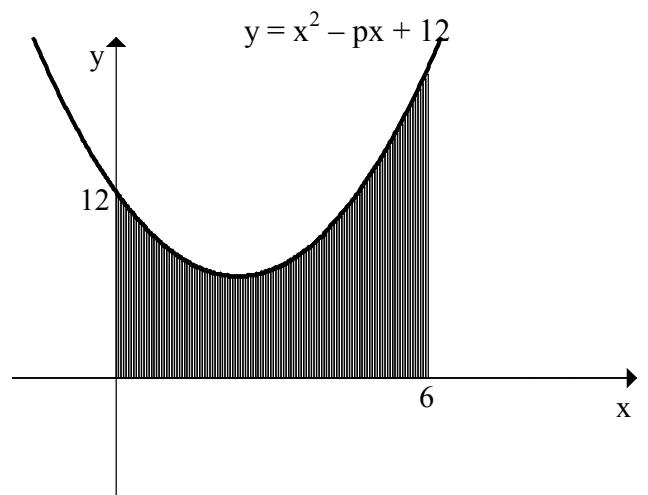
7. (a) Find the equation of the parabola opposite.
   (b)..Hence calculate the shaded area between
   this parabola and the line y = 2x.

   (4,32)

   y = 2x

   O

   8

8.In the diagram opposite the area shown
   is 60. The curve has equation
   $y = x^2 - px + 12$.

   Calculate the value of p.

   $y = x^2 - px + 12$

   12

   6

9. The diagram opposite shows the curve
   $y = x^3 + 2x^2 - 5x - 5$ and the line AB.
   The line AB is a tangent to the curve
   at the point A(-2,5).

   (a) Find the equation of the tangent AB.
   (b) Hence find the coordinates of B.
   (c) Calculate the shaded area between the
       curve and the line.

A(-2,5)

B
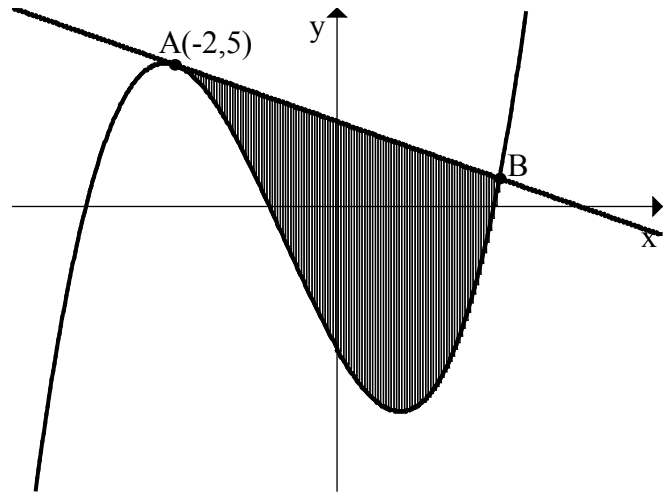
10. The diagram shows a tunnel 36 metres
    wide by 28 metres high.
    The roof of the tunnel is in the form of a
    parabola with equation $y = 24 - \frac{1}{6}x^2$.

    (a) Find the coordinates of A and B.
    (b) Calculate the shaded area.

18 m   18 m

28 m

A   B   X
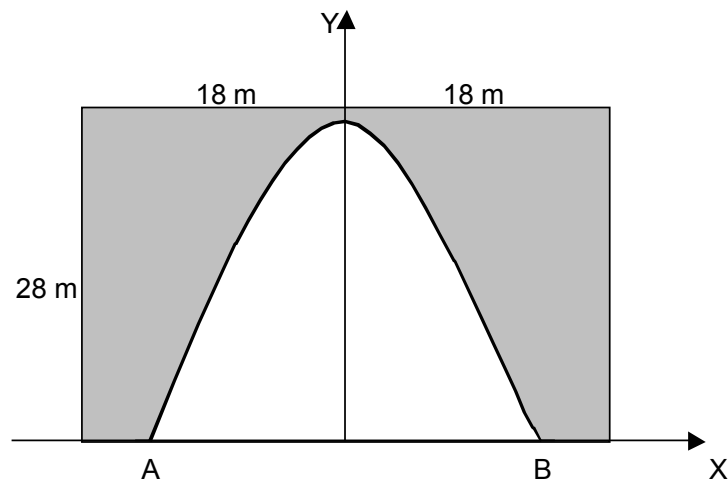
11. $f'(x) = 3x^2 - 4x + 6$ and $f(2) = 17$.
    Find a formula for $f(x)$.

12. $f'(x) = \dfrac{2x^3 - x^2}{x}$ and $f(6) = 100$.
    Find a formula for $f(x)$.

13. $f'(x) = 4x(x^2 - 1)$ and $f(-1) = 2$. Find a formula for $f(x)$.

14. The graph of $y = g(x)$ passes through the point $(3,-1)$.
    If $\dfrac{dy}{dx} = 3x^2 - \dfrac{1}{x^2}$, express y in terms of x.

15. The graphs of $y = f(x)$ and $y = g(x)$
    intersect at the point A on the y-axis.
    If $g(x) = 4x + 2$ and $f'(x) = 2x - 6$,
    find $f(x)$.

f(x)

A

g(x)