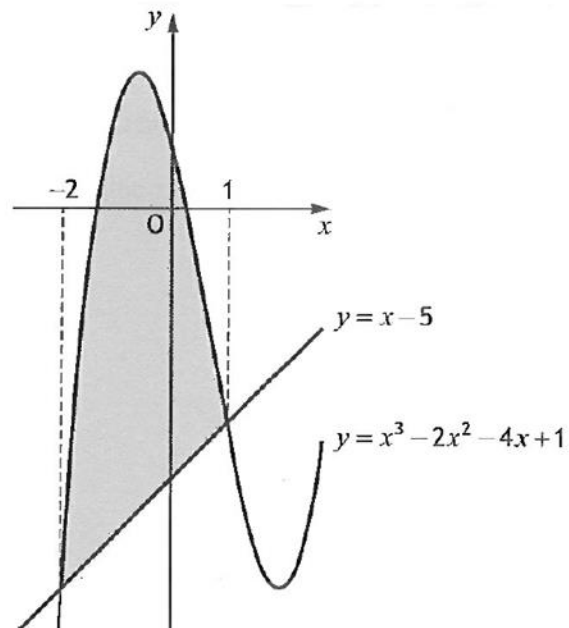# SQA Past paper questions

2023 – Paper 2 – Question 8

The diagram shows part of the curve with equation $y = x^3 - 2x^2 - 4x + 1$ and the line with equation $y = x - 5$.

The curve and the line intersect at the points where $x = -2$ and $x = 1$.
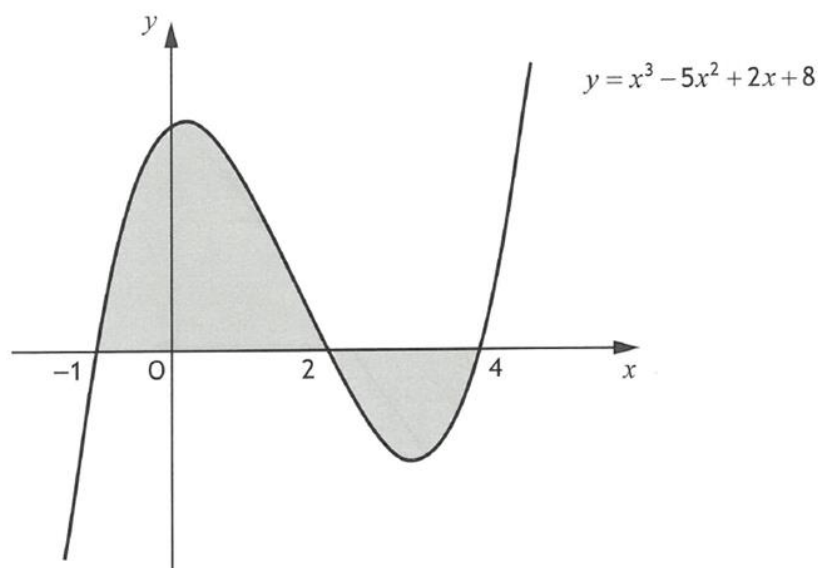
Calculate the shaded area.   5

Click here for video solution.

2022 – Paper 2 – Question 4

The graph shown has equation $y = x^3 - 5x^2 + 2x + 8$.

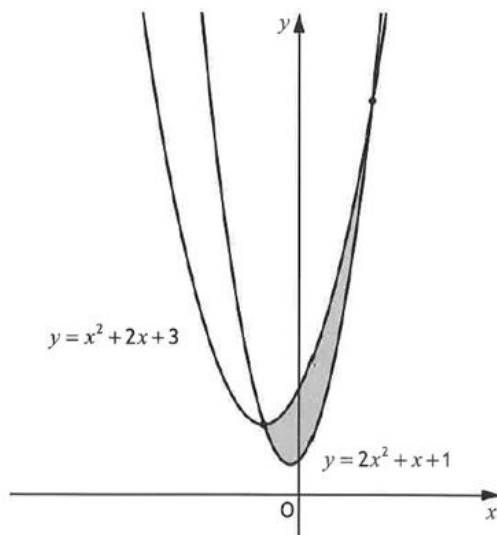The total shaded area is bounded by the curve and the x-axis.

(a) Calculate the shaded area above the x-axis.   4

(b) Hence calculate the total shaded area.   3

Click here for video solution.

2019 – Paper 1 – Question 8

The graphs of $y = x^2 + 2x + 3$ and $y = 2x^2 + x + 1$ are shown below.

The graphs intersect at the points where $x = -1$ and $x = 2$.

(a) Express the shaded area, enclosed between the curves, as an integral.   **1**
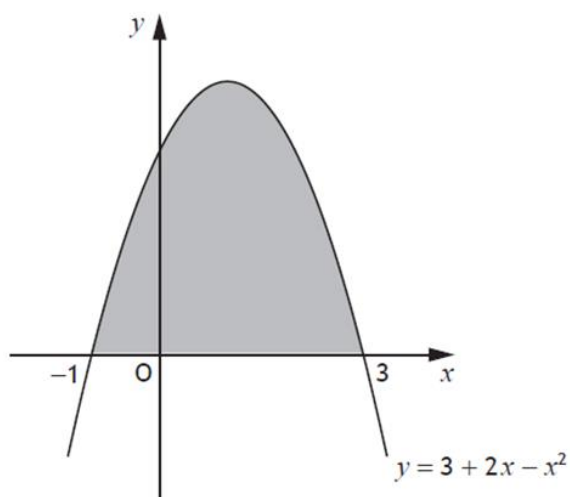
(b) Evaluate the shaded area.   **3**

Click here for video solution.

2018 – Paper 2 – Question 1

The diagram shows the curve with equation $y = 3 + 2x - x^2$.
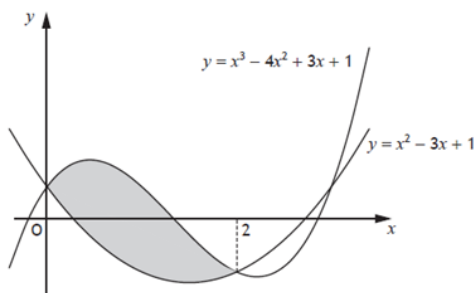

Calculate the shaded area.   **4**

Click here for video solution.

2017 – Paper 1 – Question 10

Two curves with equations $y = x^3 - 4x^2 + 3x + 1$ and $y = x^2 - 3x + 1$ intersect as shown in the diagram.
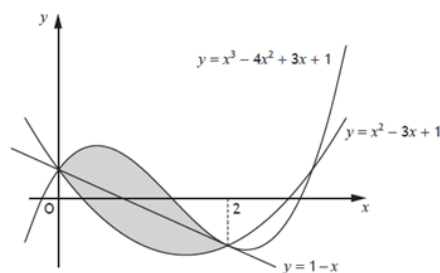
(a) Calculate the shaded area.   **5**

The line passing through the points of intersection of the curves has equation $y = 1 - x$.

(b) Determine the fraction of the shaded
     area which lies below the line $y = 1 - x$.   **4**

Click here for video solution.

2016 – Paper 2 – Question 3

(a)   (i) Show that $(x + 1)$ is a factor of $2x^3 - 9x^2 + 3x + 14$.   **2**
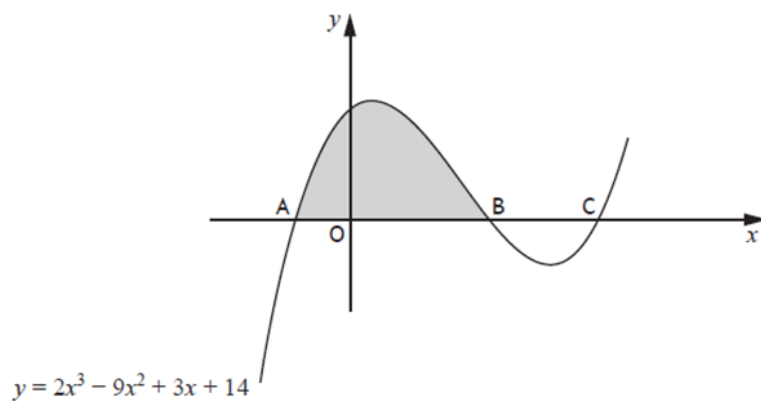
       (ii) Hence solve the equation $2x^3 - 9x^2 + 3x + 14 = 0$.   **3**

(b) The diagram below shows the graph with equation $y = 2x^3 - 9x^2 + 3x + 14$.
     The curve cuts the x-axis at A, B and C.

$y = 2x^3 - 9x^2 + 3x + 14$

       (i) Write down the coordinates of the points A and B.   **1**

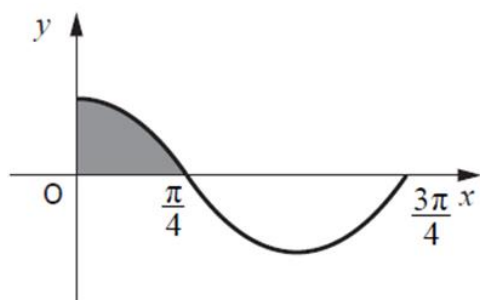   (ii) Hence calculate the shaded area in the diagram.   **4**

Click here for video solution.

2015 – Paper 1 – Question 12

The diagram shows part of the graph of $y = a\cos bx$.

The shaded area is $\frac{1}{2}$ unit².

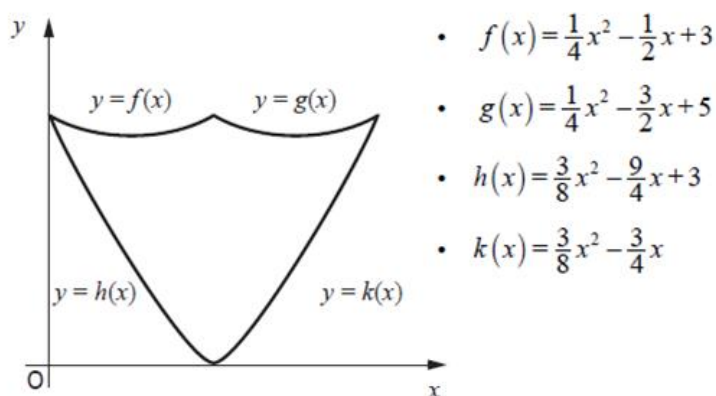What is the value of $\displaystyle\int_0^{\frac{3\pi}{4}}(a\cos bx)\,dx$?   **2**

Click here for video solution.

2015 – Paper 2 – Question 4

A wall plaque is to be made to commemorate the 150th anniversary of the publication of "Alice's Adventures in Wonderland".

The edges of the wall plaque can be modelled by parts of the graphs of four quadratic functions as shown in the sketch.

- $f(x) = \frac{1}{4}x^2 - \frac{1}{2}x + 3$

- $g(x) = \frac{1}{4}x^2 - \frac{3}{2}x + 5$

- $h(x) = \frac{3}{8}x^2 - \frac{9}{4}x + 3$

- $k(x) = \frac{3}{8}x^2 - \frac{3}{4}x$

(a) Find the x-coordinate of the point of intersection of the graphs with equations $y = f(x)$ and $y = g(x)$.   **2**

The graphs of the functions $f(x)$ and $h(x)$ intersect on the y-axis.
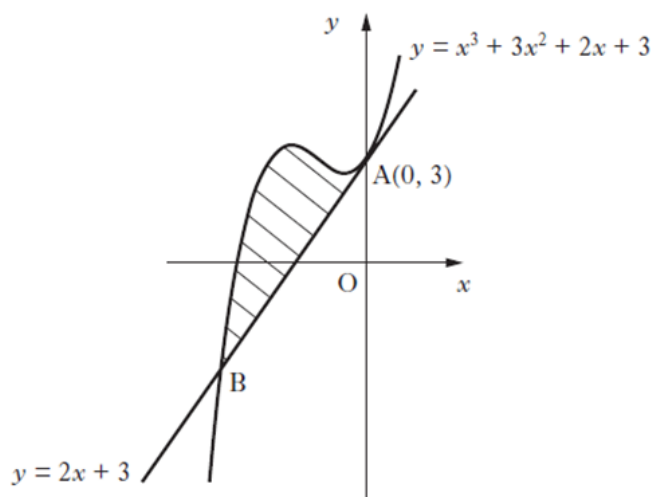
The plaque has a vertical line of symmetry.

(b) Calculate the area of the wall plaque.   **7**

Click here for video solution.

2013 – Paper 2 – Question 4

The line with equation $y = 2x + 3$ is a tangent to the curve with equation $y = x^3 + 3x^2 + 2x + 3$ at A(0, 3), as shown in the diagram.

The line meets the curve again at B.

Show that B is the point $(-3, -3)$ and find the area enclosed by the line and the curve.   6

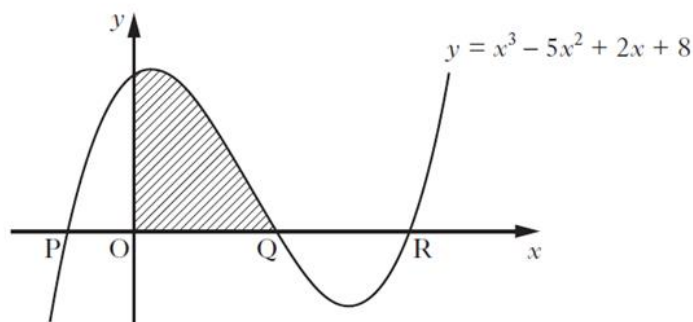Click here for video solution.

2012 – Paper 1 – Question 21

(a)   (i)   Show that $(x - 4)$ is a factor of $x^3 - 5x^2 + 2x + 8$.

(ii) Factorise $x^3 - 5x^2 + 2x + 8$ fully.

(iii) Solve $x^3 - 5x^2 + 2x + 8 = 0$.   6

(b)   The diagram shows the curve with equation $y = x^3 - 5x^2 + 2x + 8$.
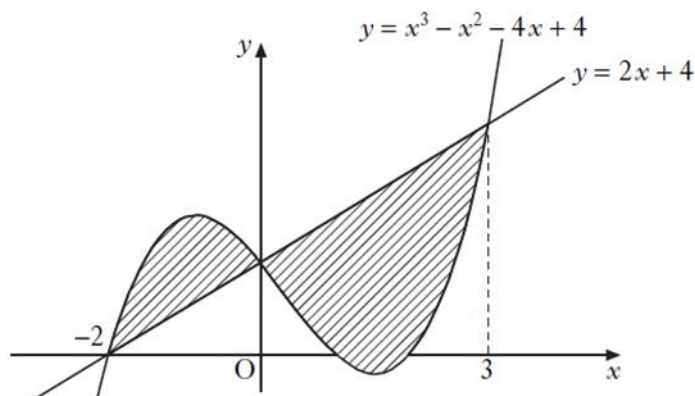

The curve crosses the x-axis at P, Q and R.

Determine the shaded area.   6

Click here for video solution.

2011 – Paper 2 – Question 4

The diagram shows the curve with equation $y = x^3 - x^2 - 4x + 4$ and the line with equation $y = 2x + 4$.

The curve and the line intersect at the points $(-2, 0)$, $(0, 4)$ and $(3, 10)$.

Calculate the total shaded area.   **10**

Click here for video solution.

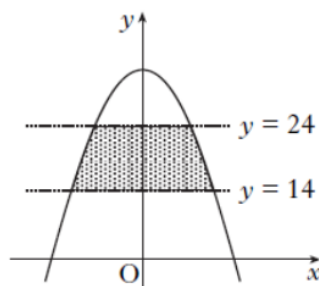## 2008 – Paper 2 – Question 7

The parabola shown in the diagram has equation

$$y = 32 - 2x^2.$$

The shaded area lies between the lines $y = 14$ and $y = 24$.
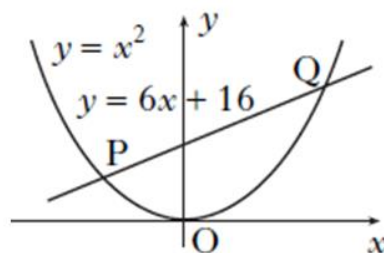
Calculate the shaded area.   **8**

Click here for video solution.

Specimen 1 – Paper 2 – Question 5

The diagram shows a curve with equation $y = x^2$ and a straight line with equation $y = 6x + 16$ intersecting the curve at P and Q.

Calculate the exact value of the area enclosed by the curve and the straight line.   **7**
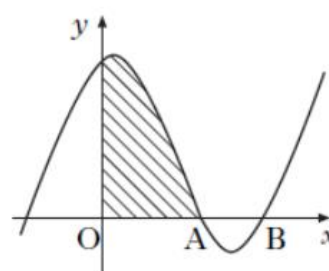

Click here for video solution.

2007 – Paper 1 – Question 8

The diagram shows a sketch of the graph of $y = x^3 - 4x^2 + x + 6$.

(a) Show that the graph cuts the x-axis at $(3, 0)$.

(b) Hence or otherwise find the coordinates of A.
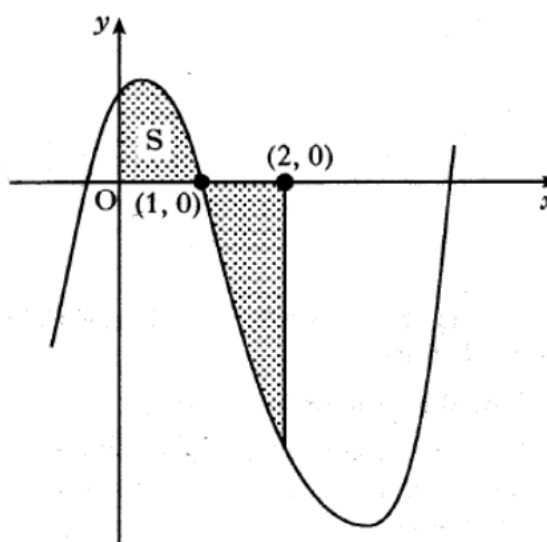
(c) Find the shaded area.

1

3

5

Click here for video solution.

2006 – Paper 1 – Question 6

The graph shown has equation $y = x^3 - 6x^2 + 4x + 1$.

The total shaded area is bounded by the curve, the x-axis, the y-axis and the line $x = 2$.

(a) Calculate the shaded area labelled S.
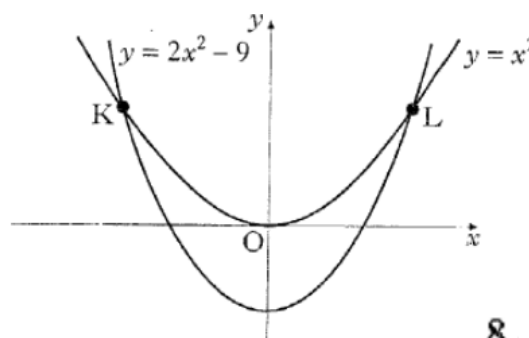
(b) Hence find the total shaded area.

4

3

Click here for video solution.

2005 – Paper 2 – Question 5

The curves with equations $y = x^2$ and $y = 2x^2 - 9$ intersect at K and L as shown.

Calculate the area enclosed between the curves.

8

Click here for video solution.

2004 – Paper 2 – Question 11

An architectural feature of a building is a wall with arched windows. The curved edge of each window is parabolic.

The second diagram shows one such window. The shaded part represents the glass.

The top edge of the window is part of the parabola with equation $y = 2x - \frac{1}{2}x^2$.

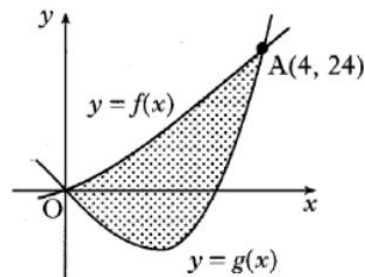Find the area in square metres of the glass in one window.

0·5 m

1·5 m

4 m

8
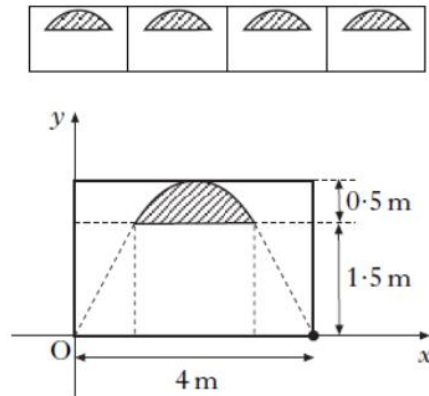
Click here for video solution.

2003 – Paper 2 – Question 3

The incomplete graphs of $f(x) = x^2 + 2x$ and $g(x) = x^3 - x^2 - 6x$ are shown in the diagram. The graphs intersect at A(4, 24) and the origin.
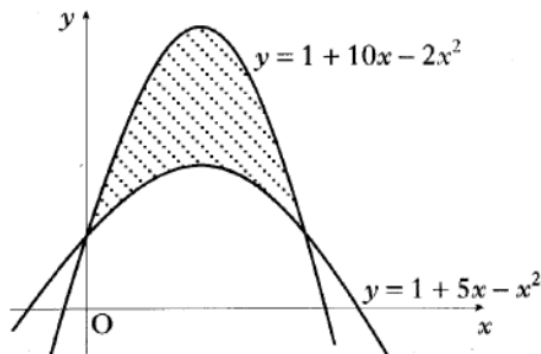
Find the shaded area enclosed between the curves.

A(4, 24)

$y = f(x)$

$y = g(x)$

5

Click here for video solution.

2002 – Paper 2 – Question 5

Calculate the shaded area enclosed between the parabolas with equations $y = 1 + 10x - 2x^2$ and $y = 1 + 5x - x^2$.

$y = 1 + 10x - 2x^2$

$y = 1 + 5x - x^2$

6

Click here for video solution.