

## Easter integration

1. Find  $\int \frac{1}{3x^4} dx$ , where  $x \neq 0$ .

A.  $-\frac{1}{9x^3} + c$

B.  $-\frac{1}{x^3} + c$

C.  $\frac{1}{x^3} + c$

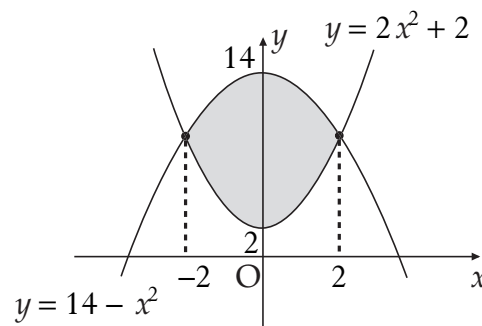
D.  $\frac{1}{12x^3} + c$

2

[SQA] 2. Find  $\int \frac{x^2 - 5}{x\sqrt{x}} dx$ .

4

3. The diagram shows graphs with equations  $y = 14 - x^2$  and  $y = 2x^2 + 2$ .



Which of the following represents the shaded area?

A.  $\int_2^{14} (12 - 3x^2) dx$

B.  $\int_2^{14} (3x^2 - 12) dx$

C.  $\int_{-2}^2 (12 - 3x^2) dx$

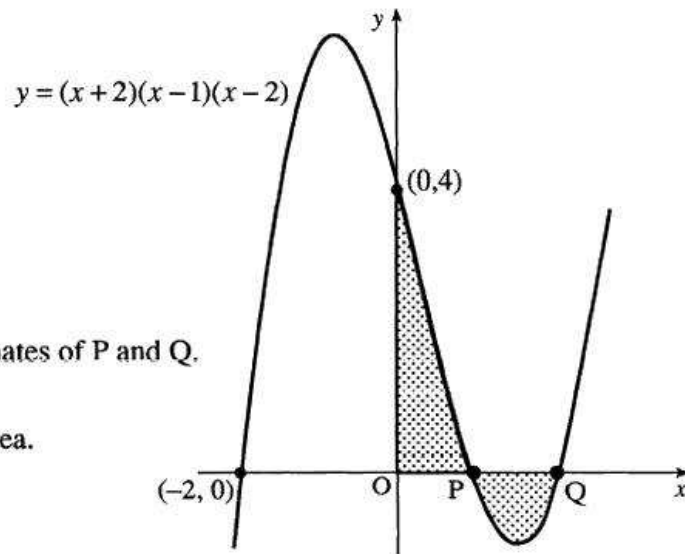
D.  $\int_{-2}^2 (3x^2 - 12) dx$

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[SQA] 4. Find  $\int (6x^2 - x + \cos x) dx$ .

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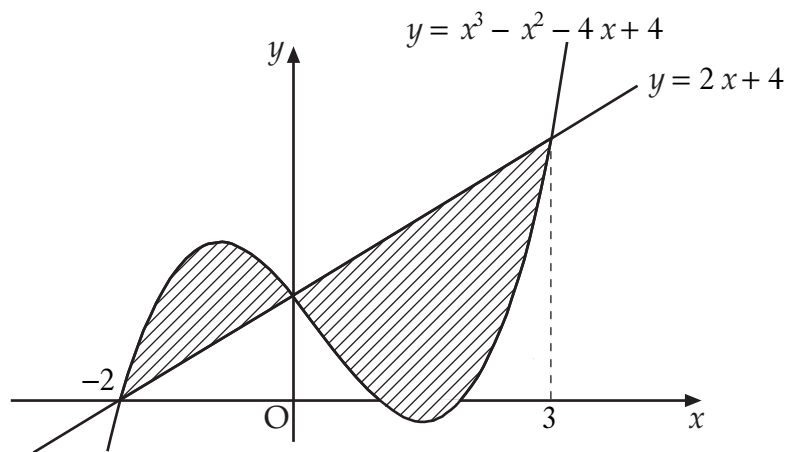
- [SQA] 5. The diagram shows a sketch of the graph of  $y = (x+2)(x-1)(x-2)$ . The graph cuts the axes at  $(-2, 0)$ ,  $(0, 4)$  and the points P and Q.



(a) Write down the coordinates of P and Q. (2)

(b) Find the total shaded area. (7)

6. 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  $(3, 10)$ .

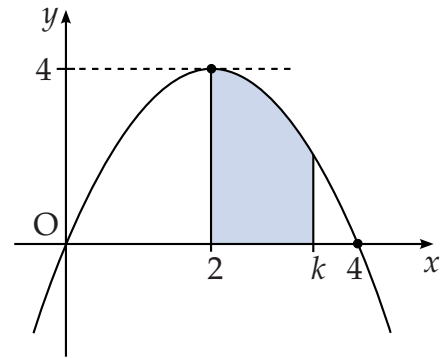


Calculate the total shaded area.

10

- [SQA] 7. The parabola shown crosses the  $x$ -axis at  $(0,0)$  and  $(4,0)$ , and has a maximum at  $(2,4)$ .

The shaded area is bounded by the parabola, the  $x$ -axis and the lines  $x = 2$  and  $x = k$ .



- (a) Find the equation of the parabola.  
 (b) Hence show that the shaded area,  $A$ , is given by

$$A = -\frac{1}{3}k^3 + 2k^2 - \frac{16}{3}.$$

8. (a) A curve has equation  $y = (2x - 9)^{\frac{1}{2}}$ .

Show that the equation of the tangent to this curve at the point where  $x = 9$  is  $y = \frac{1}{3}x$ .

- (b) Diagram 1 shows part of the curve and the tangent.

The curve cuts the  $x$ -axis at the point A.

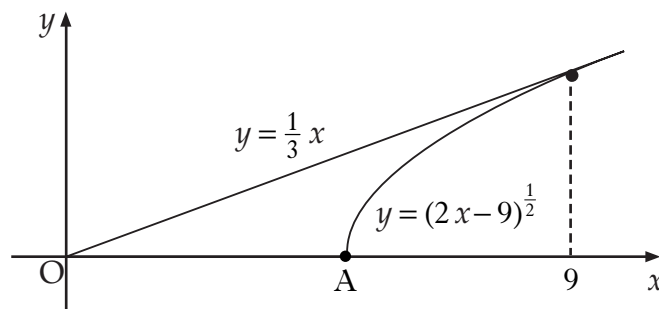


Diagram 1

Find the coordinates of point A.

- (c) Calculate the shaded area shown in diagram 2.

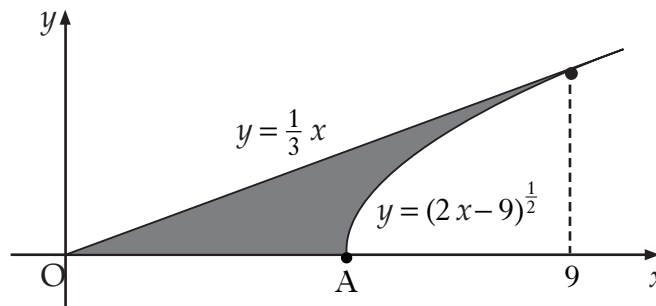
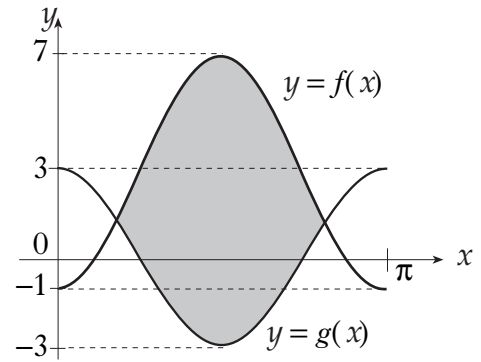


Diagram 2

[SQA] 9. The graphs of  $y = f(x)$  and  $y = g(x)$  are shown in the diagram.

$f(x) = -4 \cos(2x) + 3$  and  $g(x)$  is of the form  $g(x) = m \cos(nx)$ .

- (a) Write down the values of  $m$  and  $n$ .
- (b) Find, correct to one decimal place, the coordinates of the points of intersection of the two graphs in the interval  $0 \leq x \leq \pi$ .
- (c) Calculate the shaded area.



1

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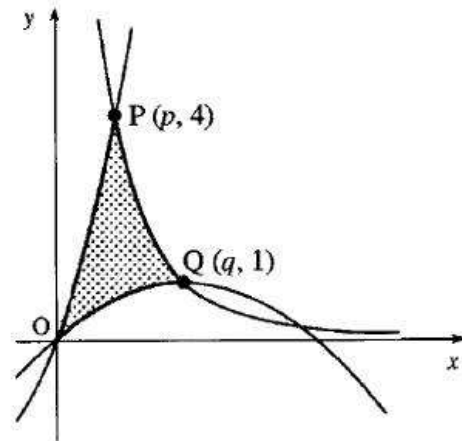
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[SQA] 10. The origin, O, and the points P and Q are the vertices of a curved 'triangle' which is shaded in the diagram.

The sides lie on curves with equations

$$y = x(x + 3), \quad y = x - \frac{1}{4}x^2 \quad \text{and} \quad y = \frac{4}{x^2}.$$

- (a) P and Q have coordinates  $(p, 4)$  and  $(q, 1)$ . Find the values of  $p$  and  $q$ .
- (b) Calculate the shaded area.



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[END OF QUESTIONS]