

Old Past Papers - Integration

[SQA] 1. Find $\int \frac{(x^2 - 2)(x^2 + 2)}{x^2} dx, x \neq 0$.

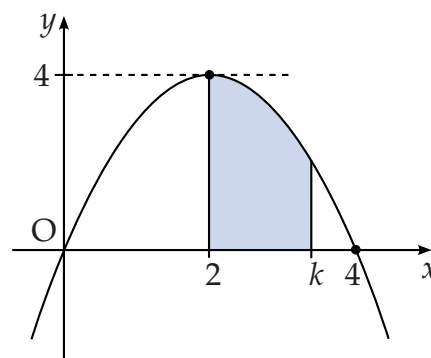
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- [SQA] 2. The parabola shown crosses the x -axis at $(0,0)$ and $(4,0)$, and has a maximum at $(2,4)$.

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

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

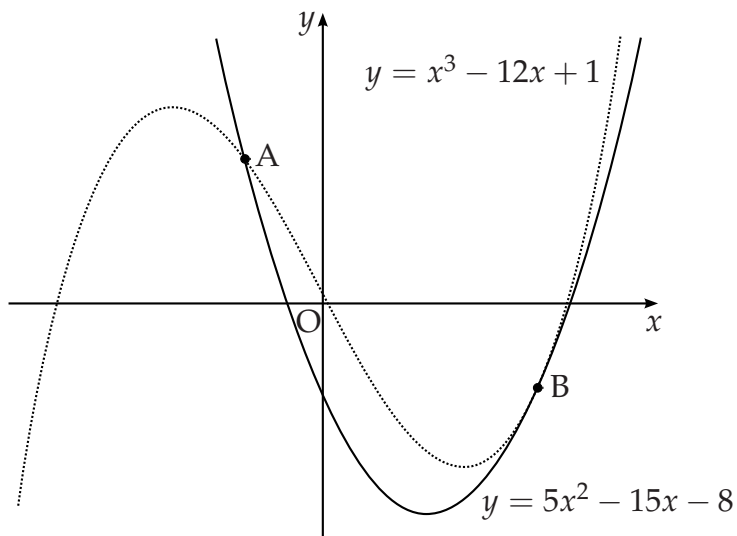


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- [SQA] 3. The diagram shows a sketch of the graphs of $y = 5x^2 - 15x - 8$ and $y = x^3 - 12x + 1$.

The two curves intersect at A and touch at B, i.e. at B the curves have a common tangent.



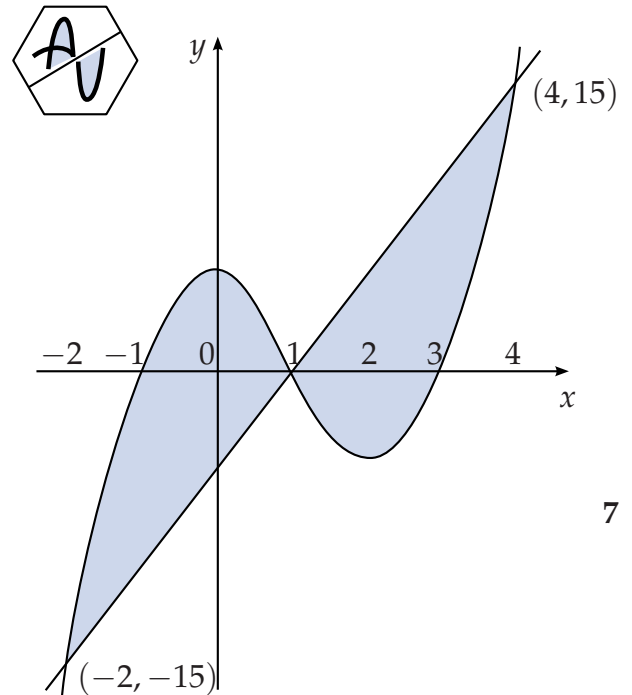
- (a) (i) Find the x -coordinates of the point of the curves where the gradients are equal. 4
- (ii) By considering the corresponding y -coordinates, or otherwise, distinguish geometrically between the two cases found in part (i). 1
- (b) The point A is $(-1, 12)$ and B is $(3, -8)$.
Find the area enclosed between the two curves. 5

- [SQA] 4. A firm asked for a logo to be designed involving the letters A and U. Their initial sketch is shown in the hexagon.

A mathematical representation of the final logo is shown in the coordinate diagram.

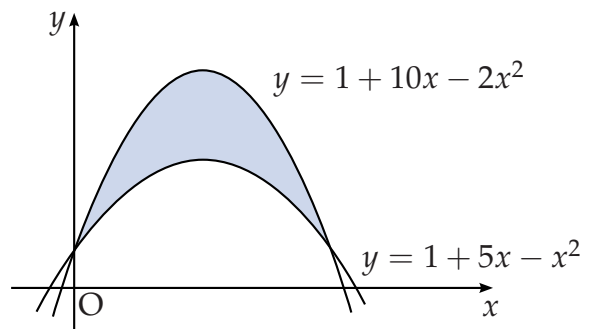
The curve has equation $y = (x + 1)(x - 1)(x - 3)$ and the straight line has equation $y = 5x - 5$. The point $(1, 0)$ is the centre of half-turn symmetry.

Calculate the total shaded area.



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



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- [SQA] 6. A point moves in a straight line such that its acceleration a is given by $a = 2(4 - t)^{\frac{1}{2}}$, $0 \leq t \leq 4$. If it starts at rest, find an expression for the velocity v where $a = \frac{dv}{dt}$.

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- [SQA] 7. The graph of $y = f(x)$ passes through the point $(\frac{\pi}{9}, 1)$.
If $f'(x) = \sin(3x)$ express y in terms of x .

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- [SQA] 8. A curve for which $\frac{dy}{dx} = 3 \sin(2x)$ passes through the point $(\frac{5\pi}{12}, \sqrt{3})$.

Find y in terms of x .

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[SQA] 9. Find $\int \frac{1}{(7-3x)^2} dx$.

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[END OF QUESTIONS]