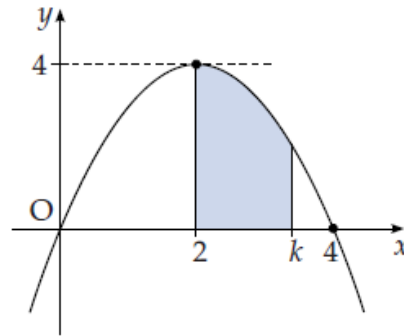


Integration to find the Area

1. 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 $x = k$.



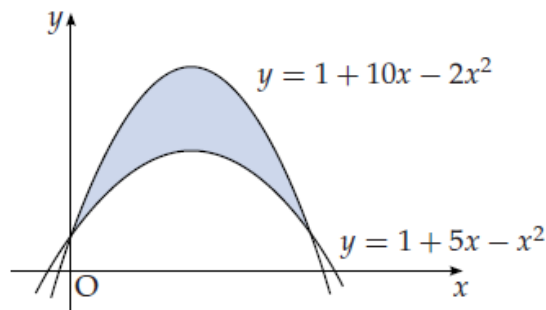
- (a) Find the equation of the parabola.
 (b) Hence show that the shaded area, A , is given by

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

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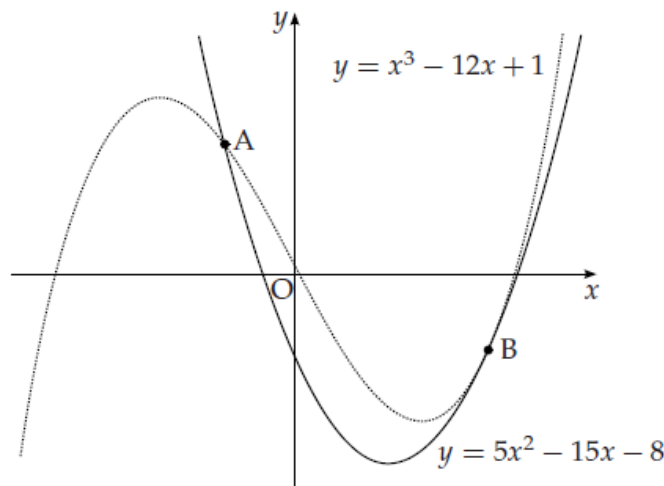
2. Calculate the shaded area enclosed between the parabolas with equations $y = 1 + 10x - 2x^2$ and $y = 1 + 5x - x^2$.



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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.
 (ii) By considering the corresponding y -coordinates, or otherwise, distinguish geometrically between the two cases found in part (i).
 (b) The point A is $(-1, 12)$ and B is $(3, -8)$.

Find the area enclosed between the two curves.

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