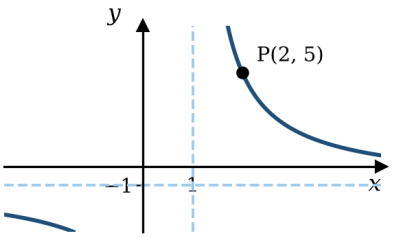
Day 98 **A Level Maths: S Tier 10-a-day**

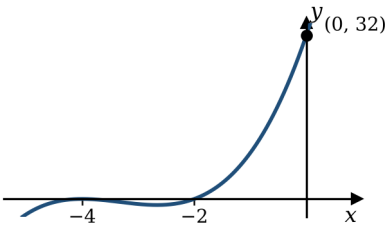
1 A chord AB of a circle, centre O and radius 2 cm, subtends an angle of $\frac{2\pi}{3}$ at O.
Find the exact area and the exact perimeter of the minor segment cut off by AB.

2 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



3 A ball is thrown vertically upwards from ground level with speed 39.2 m s^{-1}.
Find the length of time for which the ball is more than 58.8 m above the ground, and the greatest height it reaches. Take g = 9.8 m s^{-2}.

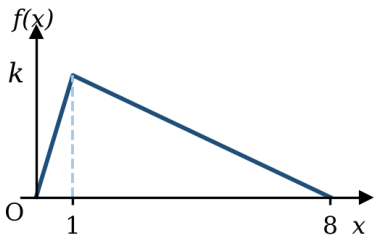
4 The diagram shows the cubic y = f(x), which touches the x-axis once. Find f(x), giving your answer in expanded form.



5 A curve is given by $x = y^3 + 3y^2 - 2y$.
Find dy/dx and d^2y/dx^2 when $y = -1$.

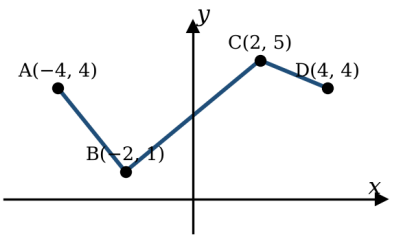
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6 The diagram shows the pdf of X.
Find (a) k, (b) E(X), (c) the median of X (3 s.f.).



7 A curve has parametric equations $x = 2t^2$, $y = t^3 + 9t$.
Find the coordinates of the points on the curve where
the gradient is 3.

8 The diagram shows y = f(x), made of three straight line segments. Find the coordinates of the images of A, B, C and D on the graph of $y = 2f(x - 2) - 3$.



9 A data set has lower quartile 17 and upper quartile 34. An outlier is a value more than 1.5 × IQR beyond the nearest quartile.
(a) Find the range of values that are not outliers.
(b) 8 observations have mean 31. The largest is 67, an outlier, and it is removed. Find the new mean.

10 Two ships A and B move with constant velocities. At time t = 0 hours, A is at $(-5\mathbf{i} - \mathbf{j})$ km relative to a fixed origin and B is at $(-12\mathbf{i} - 2\mathbf{j})$ km. A has velocity $(-2\mathbf{i} + 3\mathbf{j})$ km h^{-1} and B has velocity $(2\mathbf{i})$ km h^{-1}.
Find (a) the time at which the ships are closest together, (b) the least distance between them.