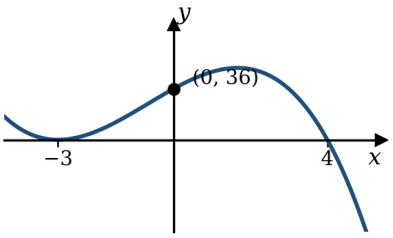
Day 141	A Level Maths: S Tier 10-a-day
1 Prove that $n(n + 6)(n + 12)(n + 18) + 1296$ is a perfect square for every integer n.	
2 Ball A is projected vertically upwards from ground level with speed 31 m s^{-1}. At the same instant, ball B is released from rest 62 m directly above A. The balls collide. Find (a) the height above the ground at which they collide, (b) the velocity of A just before the collision. Take g = 9.8 m s^{-2}.	
3 For events A and B, P(A) = 0.65, P(B) = 0.6 and P(A | B) = 0.9. (a) Find $P(A \cap B)$. (b) Find $P(A' \mid B')$.	
4 The volume of a sphere increases at a constant rate of 24π cm^3s^{-1}. When the radius is 2 cm, find the rate of increase of (a) the radius, (b) the surface area. Volume = $\frac{4}{3}\pi r^3$.	
5 Data satisfy $y = ax^n$. The line of best fit for lg y against lg x is $\lg y = 0.75 - 0.5 \lg x$. (a) Find a and n, giving a to 3 significant figures. (b) Estimate y when x = 100, to 3 significant figures.	

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6 The tangent to $y = \frac{4}{x^2 + 5}$ at the point where $x = 1$ meets the axes at A and B. Find the exact area of triangle OAB, where O is the origin.

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



8 A shell is projected from a point O on horizontal ground with speed 63.7 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{5}{12}$. Find the horizontal distance between the two points at which the shell is 25.725 m above the ground. Take $g = 9.8$ m s^{-2}.

9 Solve $\frac{2}{(x + 2)} > \frac{4}{(x - 2)}$.

10 The region bounded by $y = 2\sqrt{\sin x}$, the x-axis and the lines $x = 0$ and $x = \pi$ is rotated through 2π about the x-axis. Find the exact volume of the solid formed.