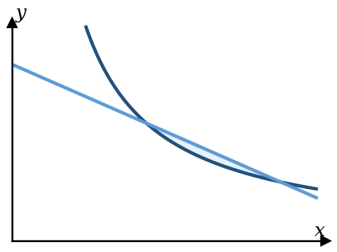
Day 212	A Level Maths: S Tier 10-a-day
1 $f(x) = x^3 + 5x^2 + 8x + 6$. Show that $(x + 3)$ is a factor of $f(x)$, and that the equation $f(x) = 0$ has exactly one real root.	
2 A drink cools according to $\theta = 20 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 95$, and after 5 minutes $\theta = 70$. Find A and k, then find when $\theta = 40$ (3 s.f.).	
3 The first row of a theatre has 8 seats. Each row has 5 more seats than the row in front. Find (a) the number of seats in row 32, (b) the least number of rows for at least 626 seats.	
4 A particle P moves with constant acceleration. At t = 0 seconds P is at $(-5\mathbf{i} - 2\mathbf{j})$ m with velocity $(-7\mathbf{i} + 14\mathbf{j})$ m s^{-1}. At t = 10, P has velocity $(33\mathbf{i} - 6\mathbf{j})$ m s^{-1}. Find (a) the acceleration of P, (b) the time at which P moves parallel to $(3\mathbf{i} + 2\mathbf{j})$, (c) the position vector of P at that time.	
5 θ is small and measured in radians. Use small angle approximations to find the value that $\frac{\sin 5\theta \tan 5\theta}{1 - \cos 4\theta}$ approaches as $\theta \to 0$.	

Day 212 **A Level Maths: S Tier 10-a-day**

6 The sum of the first n terms of a sequence is $S_n = 3n^2 + 9n$.
(a) Find an expression for u_n.
(b) Find the least n for which $u_n > 192$.

7 Data satisfy $y = ab^x$. The line of best fit for lg y against x is lg y = 0.7 + 0.5x.
(a) Find a and b to 3 significant figures.
(b) Estimate y when x = 16, to 3 significant figures.
(c) Interpret the value of b.

8 The diagram shows the curve $y = \frac{18}{x}$ and the line $y = 9 - x$.
Find the exact area of the shaded region enclosed by
the curve and the line.



9 X ~ B(17, $\frac{3}{10}$).
(a) Show that $P(X = r + 1) \div P(X = r) = \frac{17 - r}{r + 1} \times \frac{3}{7}$.
(b) Find the most likely value of X and its probability (3 s.f.).

10 A particle is projected at 5 m s^{-1} up a line of greatest slope of a rough plane inclined at α to the horizontal, where $\sin \alpha = \frac{4}{5}$ and μ = 0.95.
Find (a) the distance it travels up the plane, to 3 s.f., (b) its speed on returning to its starting point. Take g = 9.8 m s^{-2}.