Day 197	A Level Maths: A Tier 10-a-day
1 Express $\frac{-11x - 19}{(2x + 4)(x + 1)}$ in partial fractions.	
2 $f(x) = x^3 - x - 8$. Show that the equation $f(x) = 0$ has a root α in the interval $[2, 3]$.	
3 A stone is dropped from rest from the top of a cliff. In the last 2 seconds before it hits the sea it falls 127.4 m. Find the height of the cliff. Take $g = 9.8$.	
4 A and B have position vectors $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$. The point P lies on AB with AP : PB = 3 : 2. Find the position vector of P and the exact distance OP.	
5 $f(x) = \frac{-x + 2}{3x + 1}$, $x \in \mathbb{R}$, $x \neq -\frac{1}{3}$. Find $f^{-1}(x)$ and state its domain.	

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6 Particle A (3 kg) rests on a smooth table, joined by a light string over a smooth pulley at the edge to particle B (5 kg), hanging 1.5 m above the floor. Released from rest. Find (a) the tension, (b) the speed of B as it hits the floor. Take g = 9.8. Give answers to 3 s.f. if not exact.	
7 Given that (x + 3) is a factor of $f(x) = x^3 - 3x^2 - 10x + 24$, solve $f(x) < 0$.	
8 X has pdf $f(x) = \frac{3}{64}x^2$ for $0 \leq x \leq 4$, and 0 otherwise. Find E(X), Var(X) and the standard deviation of X (3 s.f.).	
9 A curve has equation $4x^2 + 2xy + y^2 = 48$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
10 The mean mass of a sack (kg) is normally distributed with standard deviation 10; it was previously 73. A random sample of 49 has mean 75. Test, at the 5% level, whether the mean has increased.	