Day 104	A Level Maths: S Tier 10-a-day

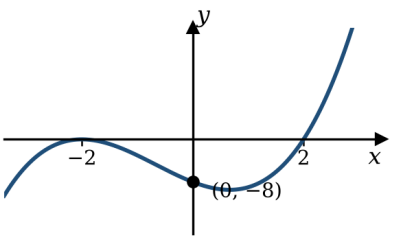
1 A ball is projected from a point O on horizontal ground at 35 m s^{-1}, at angle θ above the horizontal. It passes through the point P, 49 m horizontally and 26 m vertically from O.
Find the two possible values of $\tan\theta$, and the two possible values of θ to 1 d.p. Take g = 9.8 m s^{-2}.

2 Solve simultaneously:
$x - 2y = -2$
$x^2 + xy - y^2 = 19$

3 A stone is thrown vertically upwards with speed 18 m s^{-1} from the top of a cliff. The top of the cliff is 32.5 m above the sea.
Find (a) the time taken for the stone to reach the sea, (b) the total distance travelled by the stone, to 3 s.f. Take g = 9.8 m s^{-2}.

4 The equation $x^3 = 2x + 7$ has a root α.
(a) Show that the equation can be written as $x = \sqrt[3]{(2x + 7)}$.
(b) Use $x_{n+1} = \sqrt[3]{(2x_n + 7)}$ with $x_0 = 1$ to find x_1, x_2, x_3
to 4 d.p., and hence state α to 3 d.p.

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



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6 Large Data Set, daily total rainfall (mm), Camborne, June 2015 (n = 184): mean 3.7, sd 4.8. (1 inch = 25.4 mm) (a) Find the mean and sd in inches. (b) Is a reading of 9.9 more than 2 sd above the mean?	
7 The points A, B, C have coordinates (2, 0, 5), (3, −2, 4), (4, 0, 3). Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
8 A game costs £3. Two fair dice are rolled: a total of at least 10 wins £14, a total of at most 3 wins £3, otherwise nothing. (a) Find the expected profit. (b) Find the standard deviation of the profit (3 s.f.). (c) Find the stake that makes the game fair.	
9 $u_{n+1} = \frac{1}{4}u_n + \frac{27}{2}$, $u_1 = 12$. (a) Find the limit L of the sequence. (b) Find the least n such that $\lvert u_n - L \rvert < 0.001$.	
10 The curve C has equation $x^2 - 2xy + 5y^2 = 320$. Find the coordinates of the points on C where the tangent is parallel to the y-axis.	