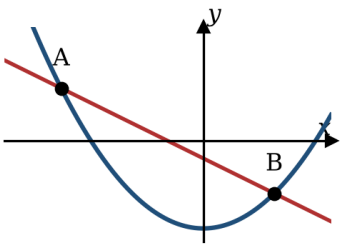
Day 19	A Level Maths: A Tier 10-a-day
1 A ball is projected from the ground at 19 m s^{-1} at angle α above the horizontal, $\tan\alpha = \frac{12}{5}$. At time T s, while in flight, it is moving perpendicular to its initial direction. Find (a) T, (b) the height of the ball then. Take g = 9.8. Give answers to 3 s.f. if not exact.	
2 On each independent trial, the probability that a bulb is faulty is $\frac{1}{6}$. X is the number of trials up to and including the first success. (a) Find P(X = 4) and E(X). (b) Find the least m with $P(X \leq m) > 0.95$.	
3 A circle has equation $x^2 + y^2 - 4x - 4y - 10 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether $P(2, -2)$ lies inside or outside the circle.	
4 Summary statistics for the daily mean visibility (Dm) in the same month are: Camborne: mean 24, standard deviation 3.9; Leeming: mean 6, standard deviation 4.6. Make two comparisons.	
5 $y = (\ln x)^2$ for $x > 0$. Find $\frac{dy}{dx}$ and its exact value at x = e.	

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6 A 3 kg block is released from rest on a rough plane inclined at α, $\tan\alpha = \frac{5}{12}$, $\mu = 0.2$, and slides 4 m down a line of greatest slope. Use work and energy to find (a) the work done against friction, (b) its speed after 4 m. Take $g = 10$. Give answers to 3 s.f. if not exact.

7 The diagram shows the curve $y = x^2 - 10$ and the line $y = -2x - 2$, meeting at A and B.
(a) Find the coordinates of A and B.
(b) Find the coordinates of the midpoint of AB.



8 A curve has equation $2x^2y + y^3 + 2x = -5$.
Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at $(2, -1)$.

9 θ is small and measured in radians. Use small angle approximations to show that
$3\sin 3\theta + 4\cos\theta = 8$
can be written as $a\theta^2 + b\theta + c = 0$ with integers a, b, c. Hence find the approximate solution with $0 < \theta < 0.8$, to 3 s.f.

10 A circle passes through A(3, 13) and B(−7, 3). Its centre lies on the line $y = 2x - 3$.
Find the equation of the circle.