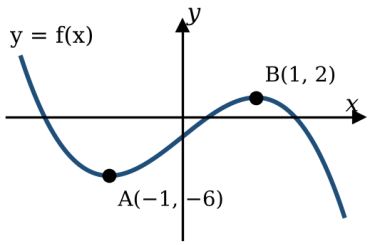
Day 223	A Level Maths: A Tier 10-a-day

1 The diagram shows the curve y = f(x), with turning points A and B.
Find the coordinates of the turning points of
(a) y = f(x − 2) (b) y = −f(x)



2 Use the substitution u = ln x to find the exact value of

$$\int_1^e \frac{(\ln x)^3}{x}\,dx.$$

3 P(A) = 0.6 and P(A ∪ B) = 0.8.
(a) Given that A and B are independent, find P(B).
(b) Given instead that A and B are mutually exclusive, find P(B).
(c) In the case in (a), find P(A′ ∩ B).

4 A curve has equation $-x^2 + 4xy - 3y^2 + y = -10$.
Show that P(−2, −3) lies on the curve and find the equation of the tangent at P in the form ax + by + c = 0 with integer a, b, c.

5 The line l has equation 2x − y = 4.
(a) Find the coordinates of the foot of the perpendicular from P(−4, 1) to l.
(b) Hence find the shortest distance from P to l, in exact form.

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6 Particles A (3 kg) and B (1 kg) hang on a light string over a smooth pulley, A being 0.5 m above the ground. Released from rest; A lands without rebounding. Find (a) the tension while both move, (b) the greatest height of B above its start. Take g = 9.8.	
7 Solve $3^{2x} - 263^{x} + 153 = 0$. Give exact roots, or 3 s.f. where the answer is not exact.	
8 The length of a plank is N(50, 3^2). A plank is classed as 'special' if its length is more than 53. 12 planks are chosen at random. Find the probability that exactly 3 are special (3 s.f.).	
9 (a) Expand $(1 - x)^{\frac{1}{2}}$ in ascending powers of x up to x^2. (b) Use x = 0.01 to estimate $\sqrt{99}$ to 3 decimal places.	
10 The system is released from rest. Find (a) the magnitude of the acceleration and which particle moves down, (b) the tension. Take g = 9.8. Give answers to 3 s.f. if not exact. 