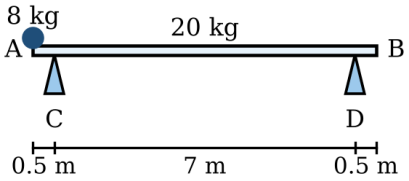
Day 308	A Level Maths: A Tier 10-a-day
1 The curve $y = f(x)$ has a maximum point at $(-1, 2)$. Find the coordinates of the corresponding point on: (a) $y = f(x - 2)$ (b) $y = f(-x)$ (c) $y = -f(x)$	
2 $y = e^{2x} - 14e^{x} + 24x$. Show that the stationary points occur where $e^{x} = 3$ and $e^{x} = 4$, and find the exact y-coordinate of each, with its nature.	
3 $f(x) = -x^2 + 2x + 5$. (a) Write $f(x)$ in the form $a(x + p)^2 + q$. (b) State the maximum value of $f(x)$ and the value of x at which it occurs. (c) Solve $f(x) = 0$, giving surds in simplest form.	
4 A lift of mass 500 kg carries a person of mass 50 kg. The cable tension is 5610 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take $g = 9.8$.	
5 A sequence is defined by $u_1 = k$ and $u_{n+1} = 3u_n + 2$. Given that $u_3 = 71$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.	

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6 A uniform beam AB rests on supports at C and D, with a particle attached at A. Find the reactions at C and D. Take g = 9.8.



7 A curve has parametric equations $x = 3\sin t$, $y = 2\cos 2t$.
Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{4}$, in the form $y = mx + c$.

8 Bulbs are defective with probability 0.25, independently. A pack of 5 bulbs is rejected if it has at least 2 defective.
From 8 such packs, find the probability that exactly 4 are rejected (3 s.f.).

9 θ is small and measured in radians. Use small angle approximations to show that
$5\sin 3\theta + \cos 2\theta = 2$
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 $X \sim B(21, p)$. H_0: $p = 0.3$ is tested against H_1: $p > 0.3$ using a 5% significance level.
(a) Find the critical region. (b) State the probability of a Type I error.
(c) Find the probability of a Type II error when $p = 0.45$ (3 s.f.).