Day 265	A Level Maths: B Tier 10-a-day
1 A particle has velocity $(2\mathbf{i} - 4\mathbf{j})$ m s^{-1} at time t = 0 and moves with constant acceleration $(2\mathbf{i} - \mathbf{j})$ m s^{-2}. Find its velocity and speed when t = 5.	
2 Given that $y = \frac{1}{(3x^2 + 1)}$, find $\frac{dy}{dx}$, and the gradient of the curve when x = 0.	
3 $f(x) = \frac{-2x - 4}{2x - 2}$ for $x \in \mathbb{R}$, $x \neq 1$. (a) Find $f^{-1}(x)$. (b) State the domain of f^{-1}.	
4 Find the exact value of $\arcsin(\sin -\frac{\pi}{3})$.	
5 A curve has equation $y = \frac{-1}{x + 1} - 2$. (a) Write down the asymptotes. (b) Find where the curve crosses the axes.	

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6 Use integration by parts to find the exact value of $\int_1^e x \ln x \, dx$.	
7 Express $\frac{20 + 3\sqrt{5}}{\sqrt{5}}$ in the form $p + q\sqrt{5}$, where p and q are integers.	
8 A factory says a proportion 0.5 of its parts are defective. In a sample of 20 parts, 6 are defective. Test, at the 5% significance level, whether the proportion is different from 0.5.	
9 A particle of mass 6 kg is suspended in equilibrium by two light strings attached to a horizontal ceiling. The strings make angles α and β with the ceiling, where $\tan \alpha = \frac{12}{5}$ and $\tan \beta = \frac{4}{3}$. Take $g = 9.8$ m s^{-2}. Find the tension in each string.	
10 Bottle volumes are normal, s.d. 8 ml. Set mean 200 ml; 40 bottles have mean 202.5 ml. Test at the 5% level whether the true mean is greater than 200.	