Day 286 **A Level Maths: B Tier 10-a-day**

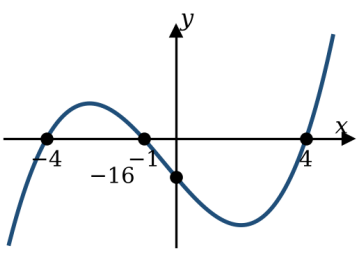
1 The vector $\mathbf{a} = \begin{pmatrix} 4 \\ -3 \\ 12 \end{pmatrix}$.
Find $|\mathbf{a}|$ and a unit vector in the direction of $\mathbf{a}$.

2 The circle C has equation $(x - 4)^2 + (y + 1)^2 = 169$.
The point P(16, 4) lies on C.
Find an equation of the tangent to C at P, in the form $ax + by + c = 0$ with integer a, b, c.

3 Each of 6 people independently supports a team with probability $\frac{1}{3}$; X is the number of supporters.
This is done 1000 times. Estimate the number of times that X = 3.

4 A particle has velocity $(4\mathbf{i} + 3\mathbf{j})$ m s^{-1} at time t = 0 and moves with constant acceleration $(4\mathbf{i} + 3\mathbf{j})$ m s^{-2}.
Find its velocity and speed when t = 4.

5 The diagram shows a sketch of the curve y = f(x), where f is a cubic. The curve meets the axes at the labelled points. Find f(x) in factorised form.



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6 Solve $\cos 2x = 1 - 3\sin x$ for $0 \leq x \leq 360°$, giving answers to 1 d.p. where necessary.	
7 $X \sim B(8, 0.4)$ and $Y \sim B(8, 0.3)$ are independent. Find $P(X = 3 \text{ and } Y \leq 2)$, to 3 significant figures.	
8 The line $3x - 4y = k$ is a tangent to the circle $(x + 4)^2 + (y + 1)^2 = 100$. Find the two possible values of k.	
9 Line l_1: $\mathbf{r} = \begin{pmatrix} 1 \\ 4 \\ -1 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix}$. Line l_2: $\mathbf{r} = \begin{pmatrix} 1 \\ 10 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} 0 \\ -2 \\ 0 \end{pmatrix}$. Show that l_1 and l_2 intersect and find the point.	
10 A particle moves on a straight line. Its displacement from O at time t seconds is $s = t^3 - 2t^2 + 2t$ metres. Find its velocity and acceleration when $t = 4$.	