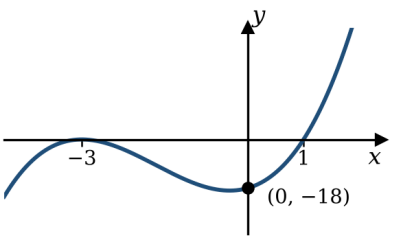
Day 90	A Level Maths: S Tier 10-a-day

1 Express $\sqrt{76 - 42\sqrt{3}}$ in the form
$a - b\sqrt{3}$, where a and b are positive integers.

2 Three forces $(5\mathbf{i} + 7\mathbf{j})$ N, $(4\mathbf{i} + k\mathbf{j})$ N and $(8\mathbf{i} - \mathbf{j})$ N act on a particle of mass 4 kg. The resultant is parallel to $(17\mathbf{i} - \mathbf{j})$.
Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.

3 The diagram shows the cubic y = f(x), which touches the x-axis once. Find f(x), giving your answer in expanded form.



4 12 recorded masses (grams) have mean 59 and standard deviation 5.
One value was recorded as 52 but should have been 63.
Find the correct mean and the correct standard deviation.

5 Find the exact coordinates of the stationary points of
$y = 5x - 10 \sin x$ for $0 \leq x \leq 2\pi$,
and determine their nature.

Day 90	A Level Maths: S Tier 10-a-day
6 Given that $\sum_{r=1}^{n}(5r - 2) = 731$, find n.	
7 A population of bacteria is modelled by $P = P_0e^{kt}$, t in hours. Initially P = 120 and after 4 hours P = 300. Find k, and the time for the population to reach 960, to 3 s.f.	
8 A box holds 10 components, each faulty with probability 0.1, independently. A box is rejected if it has at least 3 faulty components. (a) Find the probability that a box is rejected. (b) 15 boxes are inspected. Find the probability that at least 2 are rejected.	
9 $y = e^{3x} \cos 2x$. Show that $dy/dx = e^{3x}(3 \cos 2x - 2 \sin 2x)$. Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.	
10 A uniform ladder AB of length 8 m and weight 100 N has A on rough ground ($\mu = 0.4$) and B against a smooth vertical wall. It makes angle θ with the ground, $\tan\theta = 2$. A man of weight 500 N climbs the ladder. How far along the ladder can he go before it slips? 