Day 195 **A Level Maths: A Tier 10-a-day**

1 Use the trapezium rule with 4 strips to estimate $\int_0^2 2(\sqrt{x^3 + 1})\,dx$, giving your answer to 3 s.f.
State, with a reason, whether your estimate is an overestimate or an underestimate.

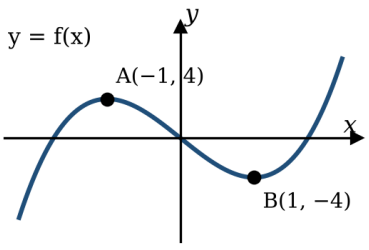
2 Express $\frac{15x + 12}{(2x + 4)(x - 4)}$ in partial fractions.

3 The table summarises the length, l mm, of leaves of 45 items.
Use linear interpolation to estimate the 90th percentile.

Class	Frequency
$20 \le l < 30$	3
$30 \le l < 40$	7
$40 \le l < 50$	9
$50 \le l < 60$	8
$60 \le l < 70$	18

4 Given that $\cos\theta = \frac{3}{4}$, find the exact value of $\cos 3\theta$.

5 X has a binomial distribution with mean 28 and variance 14.
(a) Find n and p.
(b) Find P(X = 30) to 3 significant figures.

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6 θ is small and measured in radians. Use small angle approximations to show that $5\sin 3\theta + 3\cos 2\theta = 6$ 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.	
7 A particle P has constant acceleration $(\mathbf{i} - 3\mathbf{j})$ m s^{-2}. When t = 0, P is at $(3\mathbf{i} - 3\mathbf{j})$ m moving with velocity $(-2\mathbf{i} - \mathbf{j})$ m s^{-1}. Find (a) when P moves parallel to $\mathbf{j}$, (b) its position vector then.	
8 In the expansion of $(1 + kx)^n$, where n is a positive integer, the coefficient of x is −36 and the coefficient of x^2 is 594. Find n and k.	
9 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 − 1) (b) y = −f(x) 	
10 At t = 0, P and Q have position vectors $(-7\mathbf{i} + 10\mathbf{j})$ m and $(-\mathbf{i})$ m and velocities $(4\mathbf{i} - 4\mathbf{j})$ m s^{-1} and $(2\mathbf{i} - 2\mathbf{j})$ m s^{-1}. Find (a) the time when they are closest, (b) the least distance between them. Give answers to 3 s.f. if not exact.	