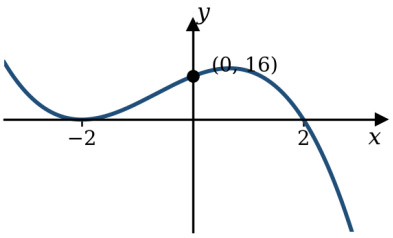
Day 51	A Level Maths: S Tier 10-a-day

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



2 Use the trapezium rule with 8 strips to estimate $\int_1^2 \sqrt{x}e^x \, dx$, to 4 s.f.
Is it an overestimate or an underestimate? Explain.

3 Three forces $(4\mathbf{i} - 5\mathbf{j})$ N, $(7\mathbf{i} + k\mathbf{j})$ N and $(\mathbf{i} + 2\mathbf{j})$ N act on a particle of mass 2 kg. The resultant is parallel to $(6\mathbf{i} - \mathbf{j})$.
Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.

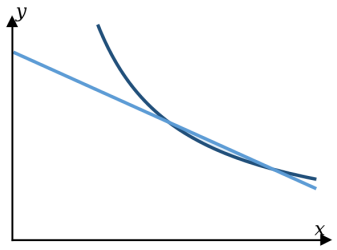
4 A binomial random variable X has mean 8 and variance 4.8.
(a) Find n and p.
(b) Find P(X = 8), correct to 3 significant figures.

5 Sam claims that $n^2 - n + 11$ is prime for every positive integer n.
Show that Sam is wrong by finding the smallest value of n that is a counter-example.

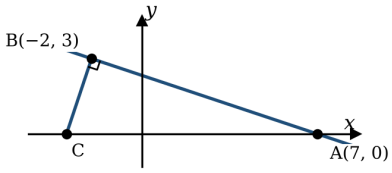
Day 51 **A Level Maths: S Tier 10-a-day**

6 A train accelerates uniformly from rest at 2 m s^{-2} to a speed of V m s^{-1}, travels at this speed, then decelerates uniformly at 2 m s^{-2} to rest. The journey takes 38 s and covers 522 m. Find V and the time spent at constant speed.

7 The diagram shows the curve $y = \frac{15}{x}$ and the line $y = 8 - x$.
Find the exact area of the shaded region enclosed by
the curve and the line.



8 In the diagram, line l_1 passes through A and B. Line l_2 is perpendicular to l_1 at B and meets the x-axis at C. Find the coordinates of C and the area of triangle ABC.



9 Line l_1: $\mathbf{r} = \begin{pmatrix} -1 \\ -1 \\ 2 \end{pmatrix} + s\begin{pmatrix} 0 \\ 2 \\ 1 \end{pmatrix}$,
line l_2: $\mathbf{r} = \begin{pmatrix} -4 \\ 1 \\ 0 \end{pmatrix} + t\begin{pmatrix} 3 \\ 0 \\ 3 \end{pmatrix}$.
Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.

10 A student's time on a task, in minutes, is $N(31, 9^2)$.
Given that it exceeds 40, find the probability that it exceeds 53.