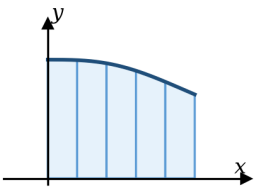
Day 53 **A Level Maths: B Tier 10-a-day**

1 A remote-control car moves with constant velocity $(-30\mathbf{i} + 40\mathbf{j})$ m s^{-1}, where $\mathbf{i}$ and $\mathbf{j}$ are unit vectors east and north.
Find its speed and the acute angle its direction makes with $\mathbf{i}$, to 1 d.p.

2 For 14 pairs of values, $\bar{x} = 8$, $\bar{y} = 10$, $S_{xx} = 100$ and $S_{xy} = 100$.
(a) Find the regression line of y on x in the form $y = a + bx$.
(b) Estimate y when $x = 12$.

3 Solve $8^{x-3} = 2^{4x-5}$.

4 The diagram shows the trapezium rule with 5 strips.
Use it to estimate $\int_0^1 \frac{1}{\sqrt{1+x^3}}\,dx$, to 3 s.f.



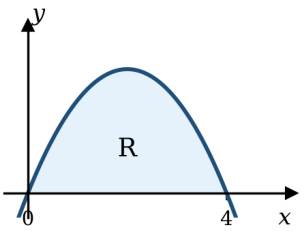
5 A curve has equation $y = \frac{-2}{x-4} + 2$.
(a) Write down the asymptotes.
(b) Find where the curve crosses the axes.

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6 The table summarises 44 measurements of m.
(a) Estimate the mean.
(b) Estimate the median using linear interpolation.

m (kg)	Frequency
$20 \le m < 25$	5
$25 \le m < 30$	14
$30 \le m < 35$	3
$35 \le m < 40$	12
$40 \le m < 45$	10

7 The region R is bounded by the curve y = x(4 − x), the x-axis
and the lines x = 0 and x = 4.
R is rotated through 360° about the x-axis. Find the exact volume generated.



8 A particle moves along a straight line so that its displacement from O after t s is $s = t^3 + 2t^2$ metres.
Find (a) the average velocity over the first 4 seconds, (b) the velocity at t = 4.

9 A geometric series has first term 9 and sum to infinity 6.
Find the common ratio and the value of the 4th term.

10 $\mathbf{a} = \begin{pmatrix} -3 \\ 1 \\ 2 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -1 \\ 0 \\ 5 \end{pmatrix}$.
Find the angle between a and b, to 1 d.p.