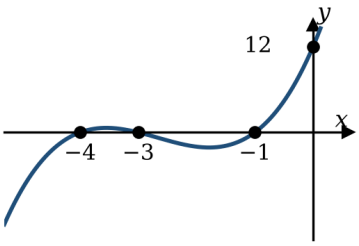
| Day 252 | A Level Maths: B Tier 10-a-day |
|---|---|
| **1** A drone moves with constant velocity $(-3\mathbf{i} + 2\mathbf{j})$ m $s^{-1}$. At time t = 0 its position vector relative to a fixed origin O is $(-7\mathbf{i} - 2\mathbf{j})$ m.<br>Find (a) its position vector when t = 6, (b) the value of t when it crosses the line through O in the direction of $\mathbf{i}$. | |
| **2** Prove that $(4n + 1)^2 - (4n - 1)^2$ is a multiple of 16 for all integer values of n. | |
| **3** Solve $2^{2x-1} = 169$, giving your answer to 3 s.f. | |
| **4** A bag has 7 red and 7 blue counters; two are taken without replacement.<br>(a) Find P(same colour).<br>(b) Given they are the same colour, find P(both red). | |
| **5** The radius of a circular oil slick increases at 0.2 cm per second.<br>Find the rate at which its area is increasing when r = 4 cm, in terms of $\pi$. | |

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**6** 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.




**7** A class of width 20, frequency 40, is a bar 5 cm wide, 4 cm tall.
(a) Find the bar height for width 20, frequency 30.
(b) Find the frequency of a 2 cm by 2.5 cm bar.

**8** (a) Expand $(1 - x)^{\frac{3}{2}}$ in ascending powers of x up to and including the term in $x^3$.
(b) State the range of values of x for which the expansion is valid.

**9** A drone moves with constant velocity $(-12\mathbf{i} + 16\mathbf{j})$ 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.

**10** Given that $\sin\theta = \frac{12}{13}$ and $0 < \theta < 90°$,
find the exact value of $\tan 2\theta$.