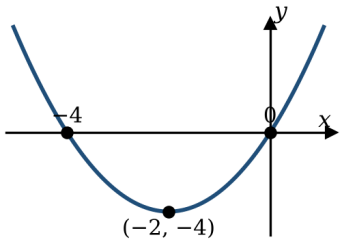
| Day 86 | A Level Maths: B Tier 10-a-day |
|---|---|
| **1** Prove that $n^2 + n + 5$ is odd for all integers n. | |
| **2** A journey takes X minutes, normal with mean 20, s.d. 4.<br>Find, to 3 s.f., the probability a value is<br>(a) less than 14,<br>(b) between 14 and 20. | |
| **3** Prove, by exhaustion, that a cube number cannot be written in the form $9k + 5$, where k is an integer. | |
| **4** $P(X = x) = kx^2$ for $x = 1, 2, ..., 6$.<br>(a) Find k.<br>(b) Find E(X) and Var(X). | |
| **5** The height of the tide in a harbour is modelled by $H = 4 + 4 \sin(\frac{\pi t}{12})$, where t is in hours after midnight.<br>Find (a) the greatest and least values, (b) the values of t with $0 \leq t \leq 24$ when it equals 2 m. | |

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**6** The diagram shows the curve y = f(x), a quadratic.
(a) Find the coordinates of the local maximum point of y = |f(x)|.
(b) How many solutions has |f(x)| = 6?




**7** A person of mass 60 kg stands on the floor of a lift. The lift accelerates upwards at 1.5 m $s^{-2}$.
Take g = 9.8 m $s^{-2}$.
Find the normal reaction between the person and the floor.

**8** An open tank has a square base of side x m and volume 32 $m^3$.
Show that its surface area is $S = x^2 + \frac{128}{x}$, and find the minimum value of S.

**9** A car of mass 1000 kg moves along a horizontal road. The engine works at a constant rate of 60 kW. The resistance to motion is constant at 500 N.
Find the acceleration when the speed is 8 m $s^{-1}$.

**10** The variables x and y satisfy $y = Ae^{kx}$. A graph of ln y against x is a straight line through (0, 0.5) and (5, 3.5).
Find A to 3 s.f. and k.