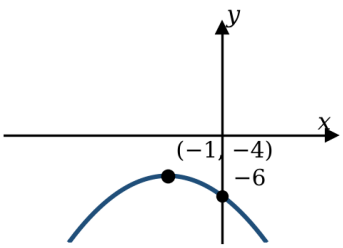
Day 212	A Level Maths: A Tier 10-a-day
1 A crate of mass 5 kg is pushed at constant speed along rough horizontal ground, $\mu = 0.25$, by a force of P N at angle θ below the horizontal, $\tan\theta = \frac{4}{3}$. Find P and the normal reaction. Take g = 9.8. Give answers to 3 s.f. if not exact.	
2 $f(x) = \frac{x-4}{4x-1}$, $x \in \mathbb{R}$, $x \neq \frac{1}{4}$. Find $f^{-1}(x)$ and state its domain.	
3 Use the trapezium rule with 4 strips to estimate $\int_0^2 5(xe^x)\,dx$, giving your answer to 3 s.f. State, with a reason, whether your estimate is an overestimate or an underestimate.	
4 Given that $\sum_{r=1}^{n}(3r+4) = 646$, find the value of n.	
5 A stone is projected vertically upwards from the ground. It passes a ledge 3 s after projection and again 4 s after projection. Find (a) the speed of projection, (b) the height of the ledge, (c) the greatest height. Take g = 9.8.	

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6 θ is small and measured in radians. Use small angle approximations to show that
$\sin 3\theta + 2\cos 3\theta = 0.5$
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 The diagram shows the curve with equation $y = f(x)$, where f is a quadratic.
The turning point is marked, and the curve crosses the y-axis as shown.
Find f(x), giving it in the form $ax^2 + bx + c$.



8 The length of a plank is $N(52, 3^2)$. A plank is classed as 'special' if its length is more than 49. 9 planks are chosen at random. Find the probability that exactly 2 are special (3 s.f.).

9 (a) Express $\frac{3x + 20}{(x + 4)(x + 6)}$ in partial fractions.
(b) Hence find $\int_0^4 \frac{3x + 20}{(x + 4)(x + 6)}\,dx$, giving the answer in the form ln k.

10 $X \sim B(33, p)$. H_0: $p = 0.4$ is tested against H_1: $p \neq 0.4$ at the 5% level.
(a) Find the critical region.
(b) Find the actual significance level of the test (3 s.f.).