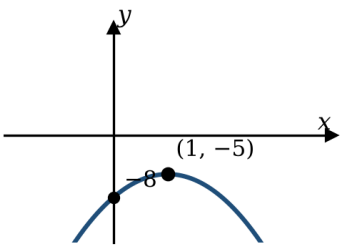
Day 10	A Level Maths: A Tier 10-a-day
1 The equation $e^x = 4x + 4$ has a root α. Use the iteration $x_{n+1} = \ln(4x + 4)$ with $x_0 = 3$ to find x_1, x_2 and x_3 to 4 d.p., and hence the value of α to 2 d.p. (continue until the 2 d.p. value is settled).	
2 Particles A (8 kg) and B (2 kg) move in the same direction on a smooth horizontal line at 8 m s^{-1} and 7 m s^{-1}. They collide and coalesce. Find (a) the speed of the combined particle, (b) the kinetic energy lost in the collision.	
3 The random variable X has $P(X = x) = k(x + 3)$ for $x = 2, 3, 4, 5$. (a) Show that $k = \frac{1}{26}$. (b) Find E(X) and Var(X). (c) Find $P(X \geq 3)$.	
4 A lift of mass 500 kg carries a person of mass 50 kg. The cable tension is 5170 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	
5 The probability that a ticket wins a prize is 0.05 on each independent trial. Find the least number of trials needed so that the probability of this happening at least once is greater than 0.995.	

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6 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 $ax^2 + bx + c$.



7 (a) Express $\frac{-4x - 14}{(x + 1)(x + 6)}$ in partial fractions.

(b) Hence find $\int_0^6 \frac{-4x - 14}{(x + 1)(x + 6)}\,dx$, giving the answer in the form ln k.

8 A sequence is defined by $u_1 = 2$ and $u_{n+1} = 1 - \frac{1}{u_n}$.

(a) Find u_2 and u_3.

(b) Find u_{99} and $\sum_{r=1}^{99} u_r$.

9 A curve has equation $3x^2y - y^3 + 4x = -6$.
Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at (−1, 2).

10 $f(x) = \frac{10x - 6}{(1 - x)(1 - 2x)}$.

(a) Express f(x) in partial fractions.

(b) Hence expand f(x) up to x^2.

(c) State the range of x for which the expansion is valid.