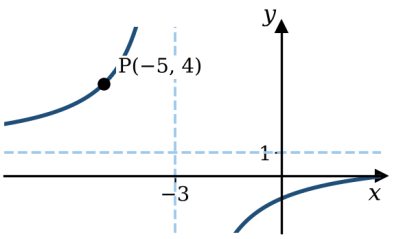
Day 273 **A Level Maths: S Tier 10-a-day**

1 An arithmetic sequence has $u_3 = 5$ and $S_{10} = 125$.
(a) Find the first term and common difference.
(b) Find the least n for which $S_n > 844$.

2 Solve $\cos(2\theta + 10°) = \frac{\sqrt{2}}{2}$
for $-90° \leq \theta \leq 270°$.

3 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



4 A stone is projected from level ground with horizontal and vertical velocity components 49 and 63.7 m s^{-1}.
Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take g = 9.8 m s^{-2}.

5 The masses of apples, in grams are modelled by $N(98, \sigma^2)$. The probability of a value below 88 is 0.20.
(a) Find σ.
(b) Find the probability of a value below 101.

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6 The curve C has equation $x^3 + xy^2 = 10$. Find the equation of the tangent to C at the point (2, 1), in the form $ax + by + c = 0$ with integers a, b, c.	
7 A particle is projected at 20 m s^{-1} up a line of greatest slope of a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{4}{5}$ and $\mu = 0.4$. Find (a) the distance it travels up the plane, to 3 s.f., (b) its speed on returning to its starting point. Take g = 9.8 m s^{-2}.	
8 The roots of $x^2 + kx + 100 = 0$ are in the ratio 4 : 1. Find the possible values of k.	
9 $y = e^{-x} \sin 3x$. Show that $dy/dx = e^{-x}(-\sin 3x + 3\cos 3x)$. Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.	
10 Two fair 6-sided dice, numbered 1 to 6, are rolled. M is the smaller of the two scores. (a) Show that $P(M = m) = \frac{(13 - 2m)}{36}$ for m = 1, 2, ..., 6. (b) Find P(M = 4) and E(M).	