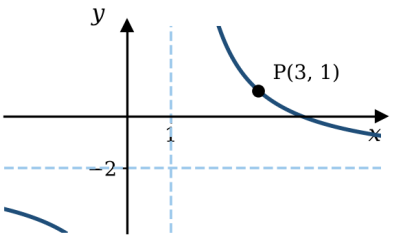
Day 282 **A Level Maths: S Tier 10-a-day**

1 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.



2 An arrow is projected from a point O on horizontal ground with speed 63.7 m s^{-1} at an angle α above the horizontal, where tan α = $\frac{5}{12}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take g = 9.8 m s^{-2}.

3 The curve $y = ab^x$ passes through (0, 6) and (4, 3750).
Find the exact values of a and b, and the value of y when x = 5.

4 A particle is projected at 18 m s^{-1} up a line of greatest slope of a rough plane inclined at α to the horizontal, where sin α = $\frac{4}{5}$ and μ = 0.55.
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}.

5 A bag has 6 red, 3 blue and 2 green counters. A player takes two without replacement. Two reds win £2, two blues win £10, anything else wins nothing.
(a) Find the expected winnings.
(b) The player pays £1 to play. Find the expected profit.

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6 The tangent to $y = \frac{x^2 + 7}{x + 4}$ at the point where $x = 1$ meets the axes at A and B. Find the exact area of triangle OAB, where O is the origin.	
7 The first term of an arithmetic sequence is 2 and its common difference d is non-zero. The 1st, 2nd and 6th terms are the first three terms of a geometric sequence. Find d and the common ratio.	
8 Each year Jo pays £300 into an account on 1 January. Interest of 3% is added each 31 December. Find the first year-end at which the balance exceeds £15,000.	
9 $y = e^{-x} \cos x$. Show that $dy/dx = e^{-x}(-\cos x - \sin x)$. Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.	
10 Data satisfy $y = ax^n$. The line of best fit for lg y against lg x is $\lg y = 1 + 1.5 \lg x$. (a) Find a and n, giving a to 3 significant figures. (b) Estimate y when x = 10, to 3 significant figures.	