Day 170 **A Level Maths: A Tier 10-a-day**

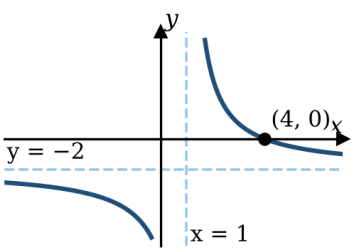
1 A cyclist passes P with speed 4 m s^{-1} and accelerates uniformly. She travels 70.4 m in the next 8 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.

2 1% of people have a disease. The screening test is positive for 95% of those who have it and for 2% of those who do not.
(a) Find the probability that a person tests positive.
(b) Given a positive test, find the probability that the person has the disease (3 s.f.).

3 (a) Solve $2x - 1 < 4$.
(b) Solve $x^2 + 4x - 5 > 0$.
(c) Hence find the values of x satisfying both inequalities.

4 Solve $4^x - 16 = 0$.
Give your answer to 3 significant figures if not exact.

5 The diagram shows the curve $y = \frac{k}{x - a} + b$ with asymptotes as shown. Find the values of k, a and b, and the coordinates where the curve crosses the axes.



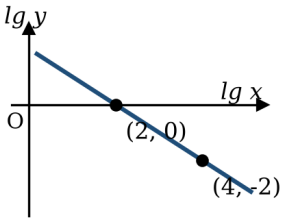
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6 The mean mass of a sack (kg) is normally distributed with standard deviation 6; it was previously 49.
A random sample of 49 has mean 48.4.
Test, at the 10% level, whether the mean has changed.

7 Particle A (7 kg) lies on a rough table, $\mu = 0.1$, joined by a light string over a smooth pulley to particle B (3 kg), 1 m above the floor. Released from rest; B lands without rebounding. Find (a) the acceleration of A before B lands, (b) the further distance A moves. Take $g = 9.8$.

8 $g(\theta) = \dfrac{1}{11 + 6\sin\theta + 8\cos\theta}$
(a) Write $6\sin\theta + 8\cos\theta$ in the form $R\sin(\theta + \alpha)$, with α acute.
(b) Find the greatest and least values of $g(\theta)$ and the smallest positive θ at which the greatest value occurs (1 d.p.).

9 The diagram shows the graph of lg y against lg x for $y = A x^n$.
Find the value of n and the value of A.



10 $f(x) = \dfrac{-8x + 1}{(1 - 2x)(1 + x)}$.
(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.