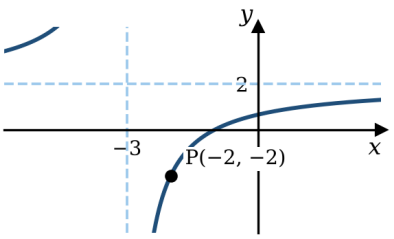
Day 285 **A Level Maths: S Tier 10-a-day**

1 $f(x) = x^3 + x^2 - 6x - 11$.
(a) Show that $f(x) = 0$ has a root α with $2 < \alpha < 3$.
(b) Use Newton-Raphson with $x_0 = 2$ to find x_1 and x_2
to 4 decimal places.

2 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.



3 Find the exact gradient of the curve $y = 7^{4x - 2}$ at the point where $x = \frac{3}{2}$.

4 A train accelerates uniformly from rest at 1 m s^{-2} to a speed of V m s^{-1}, travels at this speed, then decelerates uniformly at 1.5 m s^{-2} to rest. The journey takes 56 s and covers 552 m. Find V and the time spent at constant speed.

5 Describe a sequence of two transformations that maps the curve $y = x^2$ onto the curve $y = -2x^2 - 20x - 53$.

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6 For events A and B, P(A) = 0.4, P(B) = 0.55 and P(A | B) = 0.15.
(a) Find P(A ∩ B).
(b) Find P(A | B′).

7 $u_{n+1} = -\frac{1}{3}u_n + 20$, $u_1 = 3$.
(a) Find the limit L of the sequence.
(b) Find the least n such that $|u_n - L| < 0.01$.

8 $f(\theta) = \frac{4}{19 + 5\sin\theta + 12\cos\theta}$
(a) Write $5\sin\theta + 12\cos\theta$ as $R\sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$.
(b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.

9 A and B take turns, A first, to score; the first to score wins. P(A scores) = $\frac{1}{6}$, P(B scores) = $\frac{1}{6}$ each attempt.
Find P(A wins (a) on attempt 1 or 2, (b) overall).

10 A uniform rod AB (2 m, 60 N) is hinged at A to a vertical wall and held horizontal by a string BC, C on the wall above A, with $\tan\alpha = \frac{5}{12}$, where α is the angle between string and rod. A 50 N particle hangs at P, AP = 1.5 m.
Find (a) the tension, (b) the magnitude and direction of the hinge force (3 s.f. and 1 d.p.).

