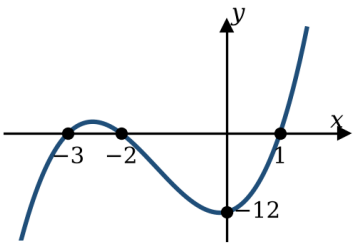
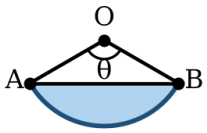
Day 363 **A Level Maths: A Tier 10-a-day**

1 The diagram shows a sketch of the curve y = f(x), where f(x) is a cubic.
Find f(x), giving your answer in expanded form.



2 A 6 kg particle rests on a rough plane inclined at α, $\tan\alpha = \frac{3}{4}$, μ = 0.5. A force of P N acts up a line of greatest slope and the particle stays at rest. Find the range of values of P. Take g = 9.8.

3 The circle has centre O and radius 8 cm. Angle AOB = $\frac{2\pi}{3}$.
Find the exact area and the exact perimeter of the shaded segment.



4 For 20 values of x, $\Sigma(x - 50) = 30$ and $\Sigma(x - 50)^2 = 50$.
Find the mean and standard deviation of x.

5 The curve with equation $y = -x^2 + 2x + 4$ is transformed by a stretch, scale factor 2, parallel to the x-axis, followed by a reflection in the x-axis.
Find the equation of the image curve.

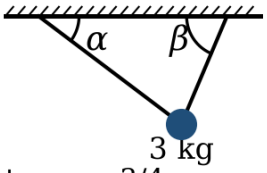
Day 363 **A Level Maths: A Tier 10-a-day**

6 For small x (in radians), use the small angle approximations to find the value that

$$\frac{1 - \cos 2x}{x \sin 4x}$$

approaches as $x \to 0$.

7 A 3 kg particle hangs in equilibrium from two light strings, as shown. Find the tension in each string (T_1 in the string at angle α). Take g = 9.8. Give answers to 3 s.f. if not exact.



$\tan \alpha = 3/4$
$\tan \beta = 12/5$

8 For n = 8 pairs of (x, y): $\Sigma x = 129$, $\Sigma y = 396$, $\Sigma x^2 = 2605$, $\Sigma y^2 = 20358$, $\Sigma xy = 6945$. Calculate the product moment correlation coefficient, and describe the correlation.

9 A sequence is defined by $u_1 = k$ and $u_{n+1} = 2u_n - 1$.
Given that $u_3 = -7$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.

10 $g(x) = \frac{1}{30 + 24 \sin x + 7 \cos x}$
(a) Write $24 \sin x + 7 \cos x$ in the form $R \sin(x + \alpha)$, with α acute.
(b) Find the greatest and least values of g(x) and the smallest positive x at which the greatest value occurs (1 d.p.).