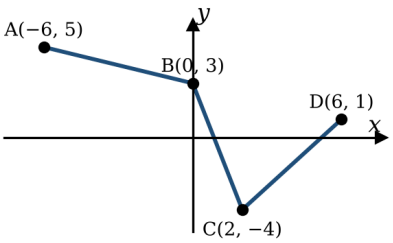
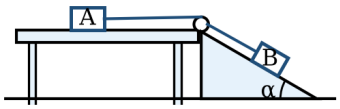
Day 240 **A Level Maths: S Tier 10-a-day**

1 The diagram shows y = f(x), made of three straight line segments. Find the coordinates of the images of A, B, C and D on the graph of $y = -f(-\frac{1}{2}x - 2)$.



2 The equation $x^3 = 4x + 5$ has a root α.
(a) Show that the equation can be written as $x = \sqrt[3]{(4x + 5)}$.
(b) Use $x_{n+1} = \sqrt[3]{(4x_n + 5)}$ with $x_0 = 3$ to find x_1, x_2, x_3
to 4 d.p., and hence state α to 3 d.p.

3 Particle A (4 kg) lies on a rough table with μ = 0.25, and is joined by a light string over a smooth pulley (see diagram) to particle B (6 kg) on a smooth slope, α = 30°.
Released from rest, the string is cut when B has moved 3.25 m. Find the further distance A slides before stopping.



4 (a) Show that $\tan\theta + \cot\theta \equiv 2\operatorname{cosec} 2\theta$.
(b) Hence solve $\tan\theta + \cot\theta = 5$ for $0 \leq \theta < 360°$ (1 d.p.).

5 A particle P moves in a plane. At time t seconds its position vector relative to a fixed origin O is r metres, where
$\mathbf{r} = (0.5t^2 - 6t)\mathbf{i} + (-3t^2 - 4t)\mathbf{j}$.
Find (a) the value of t at which P is moving parallel to $(\mathbf{i} + 2\mathbf{j})$, (b) the speed of P at this time (3 s.f. if not exact).

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6 $f(x) = \frac{18}{2x^2 - 4x + 6}$ for all real x. Find the greatest value of f(x), the value of x at which it occurs, and the range of f.	
7 The times taken by a bus, in minutes are normally distributed. 25% are less than 49 and 5% are greater than 68. Find the mean and standard deviation, each correct to 3 significant figures.	
8 The circle $x^2 + y^2 - 6x - 2y - 15 = 0$ passes through P(7, −2). The tangent at P meets the axes at A and B. Find the area of triangle OAB.	
9 Use a suitable trigonometric identity to find the exact value of $\int_0^{\pi/4} \tan^2 x \, dx$	
10 The pdf of X is $f(x) = a + bx$ for $0 \leq x \leq 2$, and 0 otherwise, where a and b are constants. $E(X) = \frac{7}{6}$. (a) Find a and b. (b) Find P(X < 1).	