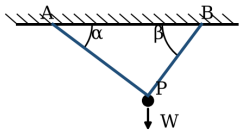
Day 250 **A Level Maths: S Tier 10-a-day**

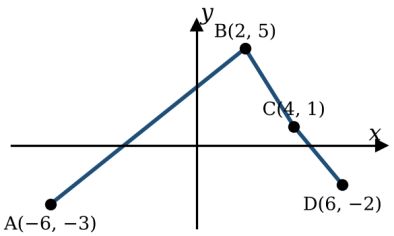
1 Solve the simultaneous equations
$\lg x - \lg y = 2$
$x + y = 1010$

2 A curve has parametric equations
$x = 3t^2$, $y = 3t^3$.
Show that $y^2 = kx^3$ and find k.

3 A particle P of weight 80 N hangs in equilibrium from two light strings AP and BP attached to a horizontal ceiling at A and B (see diagram), where $\tan\alpha = \frac{3}{4}$ and $\tan\beta = \frac{4}{3}$.
Find (a) the tension in each string, (b) the greatest weight P could have if neither tension may exceed 84 N.



4 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 $y = 2f(-2x - 8) - 1$.



5 Find the exact coordinates of the stationary points of
$y = \frac{x}{x^2 + 9}$,
and determine the nature of each.

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6 For n = 10 pairs of values: $\Sigma x = 90$, $\Sigma y = 550$, $\Sigma x^2 = 870$, $\Sigma xy = 4998$. (a) Find the equation of the regression line of y on x. (b) The x values lie between 5 and 14. Estimate y when x = 13 and comment on its reliability.	
7 $g(x) = x^2 - 4$. Also $fg(x) = 4x^2 - 7$, where f is a linear function. (a) Find f(x). (b) Solve gf(x) = 21.	
8 The cdf of X is $F(x) = 0$ for $x < 0$, $F(x) = 1 - (1 - \frac{x}{5})^2$ for $0 \leq x \leq 5$, and $F(x) = 1$ for $x > 5$. (a) Find the pdf of X. (b) Find E(X). (c) Find $P(1.25 < X < 2.5)$ and the median, to 3 significant figures.	
9 A rectangle has its base on the x-axis and its upper vertices on the curve $y = 48 - x^2$, symmetric about the y-axis. Find the maximum area of the rectangle, with justification.	
10 Two ships A and B move with constant velocities. At time t = 0 hours, A is at $(\mathbf{i} + 7\mathbf{j})$ km relative to a fixed origin and B is at $(-7\mathbf{i} + 26\mathbf{j})$ km. A has velocity $(3\mathbf{i} - 4\mathbf{j})$ km h^{-1} and B has velocity $(6\mathbf{i} - 8\mathbf{j})$ km h^{-1}. Find (a) the time at which the ships are closest together, (b) the least distance between them.	