SPTA
Higher Homework
Mixed 10 Vectors, Angle Formulae, Int & Wave Function

1. A is the point $(3, -3, 0)$, B is $(2, -3, 1)$ and C *is* $(4, k, 0)$.

(a) (i) Express $\overrightarrow{BA}$ and $\overrightarrow{BC}$ in component form.

(ii) Show that $\cos A\hat{B}C = \dfrac{3}{\sqrt{2(k^2+6k+14)}}$ **(7)**

(b) If angle $ABC = 30°$, find the possible values of k. **(5)**

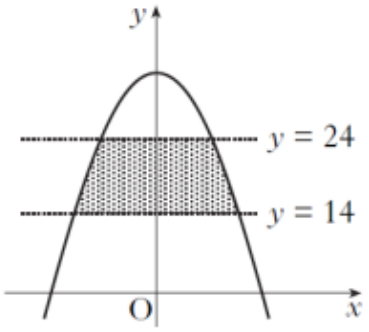
2. (a) $12\cos x° - 5 \sin x°$ can be expressed in the form $k\cos(x + a)°$, where $k > 0$ and $0 \leq a < 360$.

Calculate the values of k and a. **(4)**

(b) (i) Hence state the maximum and minimum values of $12\cos x° - 5\sin x°$.
(ii) Determine the values of x, in the interval $0 \leq x < 360$, at which these maximum and minimum values occur. **(3)**

3. The parabola shown in the diagram has equation

$$y = 32 - 2x^2.$$



The shaded area lies between the lines $y = 14$ and $y = 24$.

Calculate the shaded area. **(8)**

2. Solve the equation $\cos 2x° + 2\sin x° = \sin^2 x°$ in the interval $0 \leq x < 360$. **(5)**

3. (a) Using the fact that $\frac{7\pi}{12} = \frac{\pi}{3} + \frac{\pi}{4}$, find the exact value of $\sin\left(\frac{7\pi}{12}\right)$ **(3)**

(b) Show that $\sin(A + B) + \sin(A - B) = 2\sin A\cos B$ **(2)**

(c) (i) Express $\frac{\pi}{12}$ in terms of $\frac{\pi}{3}$ and $\frac{\pi}{4}$
(ii) Hence or otherwise find the exact value of $\sin\left(\frac{7\pi}{12}\right) + \sin\left(\frac{\pi}{12}\right)$ **(4)**