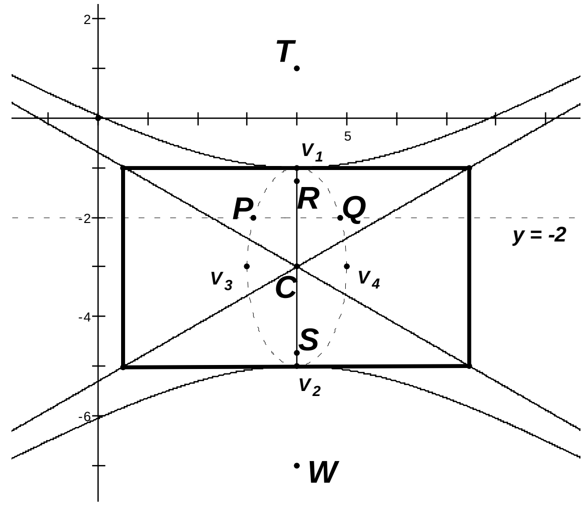
Team Question A: Center $C(4,-3)$

Since $a=2, b=2\sqrt{3}$ and $c=4$ for the hyperbola, and $a=2, b=1$ and $c=\sqrt{3}$ for the ellipse.

$R\left(4,\,-3+\sqrt{3}\right)$, $S\left(4,\,-3-\sqrt{3}\right)$

$T(4,1)$, $W(4,-7)$

$V_3(3,-3)$, $V_4(5,-3)$




Since the slope of asymptotes are $\pm\dfrac{2}{2\sqrt{3}}=\pm\dfrac{\sqrt{3}}{3}$,

the point-slope equations of the asymptotes are $(y+3)=\pm\dfrac{\sqrt{3}}{3}(x-4)$.

In the diagram below, graphically, it certainly appears as if the hyperbola approaches arbitrarily close to these lines. Analytically, why is this the case?

Staring with $3(y+3)^2-(x-4)^2=12 \Leftrightarrow \dfrac{(y+3)^2}{4}-\dfrac{(x-4)^2}{12}=1$, solve for *y*.

$$(y+3)^2=\frac{(x-4)^2}{3}+4$$

As $x\to\pm\infty$, that is, as *x* becomes an arbitrarily large positive number (moving to the right on the graph) or an arbitrarily small negative number (moving to the left on the graph), the 4 becomes *negligible* and we have

$$(y+3)^2\approx\frac{(x-4)^2}{3} \Leftrightarrow y+3\approx\pm\frac{1}{\sqrt{3}}(x-4)$$

Thus, as $x\to\pm\infty$, the *y*-coordinate of a point on the straight lines (the asymptotes) becomes an increasingly better approximation of the *y*-coordinate of the corresponding point on corresponding branch of the hyperbola.

Q.E.D ('Quod erat demonstratum', Latin for "enough said", literally "that which was to be demonstrated")