Please can you explain to me how to answer his question:

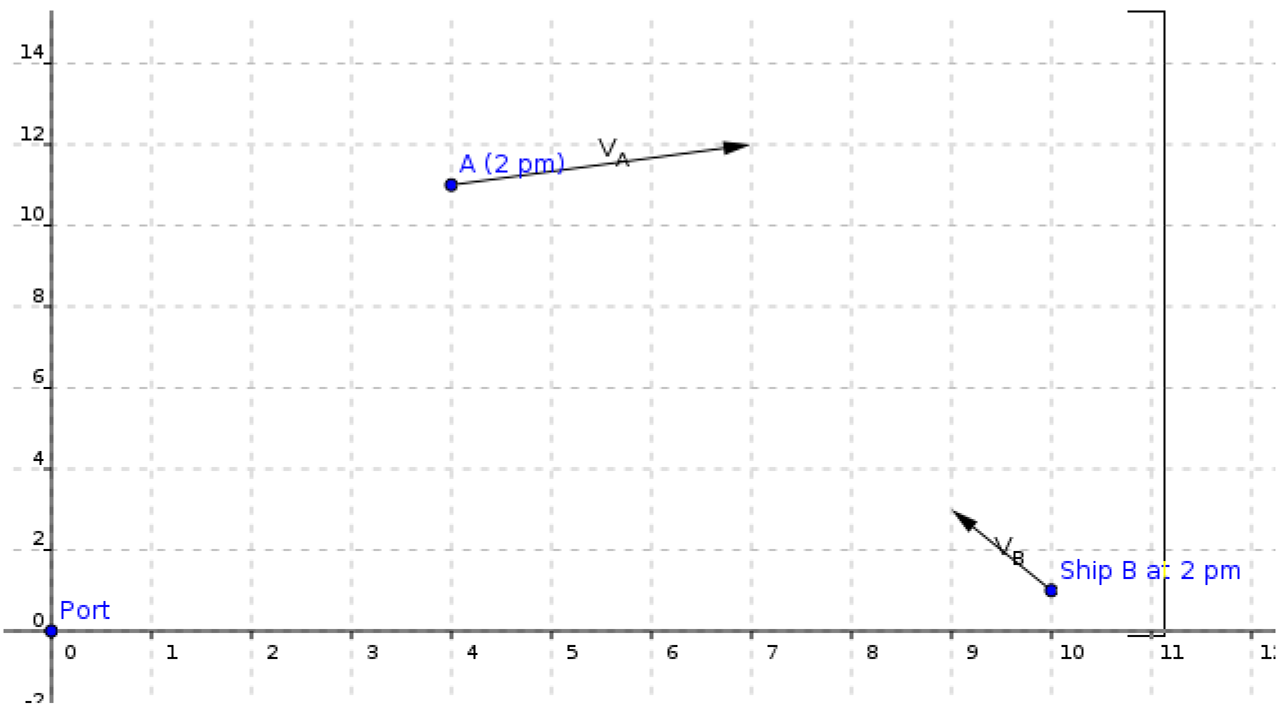
At 2pm, two ships A and B start simultaneously from points that have position vectors 4i+11j and 10i+j respectively relative to a port. ShipA maintains a steady velocity of 3i+j. if the velocity of shipA relative to shipB is 4i-j, find

i,the velocity of ship B
ii,the time at which the ships are nearest to each other
iii,the least distance between the ships
iv,the position vector of the ships relative to the port at the time they are nearest to each other...

i realy need the steps and explanations to this problem..

Okay, here's my take on the problem. It is not the only way but it follows the steps that I think the examiner wants you to follow.

Start by drawing a picture of the initial positions of the ships A and B. You are given the velocity of A but not that of B. So in the beginning you don't have the arrow marked $V_{B.}$.



Let's just assume for the sake of simplicity that distances are measured in metres and time in seconds.

The velocity of A relative to B is given by $V_{A/B}=V_A-V_B$. Plug in the known vectors to obtain V_B . You can now draw it on the diagram and can get a feel for how the positions of A and B are changing with time.

Now if the position of A at 2 pm is (4,11) metres and it moves with $V_A=\begin{pmatrix}3\\1\end{pmatrix}$ metres per second, what will its position be one second later, two seconds later, three seconds later? Remember that

$V_A = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ means that for every second, you move 3 steps in the x-direction and 1 step up in the y-direction. And can you generalize for its position t seconds later? Call the position of A after t seconds $\vec{OA'}$

Since you obtained V_B from part (1), you can generalize for the position of B at any time t. Call it

$\vec{OB'}$

Now the distance between A and B at any time t is therefore given by $\vec{A'B'} = \vec{OA'} - \vec{OB'}$ and it will be in terms of t in fact, $\begin{pmatrix} -6+4t \\ 10-t \end{pmatrix}$. If you get this, then it means that you've got all the above right.

Now to find the times at which the ships are nearest to each other, you'd have to find the modulus of the displacement vector $\vec{A'B'}$.

Say you have a displacement vector $\vec{A'B'} = \begin{pmatrix} a+bt \\ c+dt \end{pmatrix}$, the square of the distance between A' and B' is given by $D^2 = (a+bt)^2 + (c+dt)^2$. (This is just Pythagoras' Theorem).

Differentiate D^2 and then for minimum D and therefore minimum D^2 , set the derivative of D^2 to zero.

I'll assume you know how to differentiate simple algebraic functions.

Anyhow, by setting the derivative of D^2 to zero, you should get the value of t at which both ships are nearest to each other.

With this value of t, substitute back in the expressions for $\vec{OA'}$ and $\vec{OB'}$

Alternatively, you could play around with the numbers on graph paper...