Part I - Projections

The following exercise is for visualizing projections. Let $\mathbf{a} = \langle 2, 3 \rangle$, $\mathbf{b} = \langle 7, 2 \rangle$. Mark each vector on both pictures below.

1. Compute the angle between them. Look at the pictures below to see your answer makes sense.

2. Compute the vector projection $\mathbf{proj}_{\mathbf{a}}\mathbf{b}$. Verify your answer by drawing the vector projection $\mathbf{proj}_{\mathbf{a}}\mathbf{b}$ on the graph below.



3. Compute the vector projection $\mathbf{proj}_{\mathbf{b}}\mathbf{a}$. Verify your answer by drawing the vector projection $\mathbf{proj}_{\mathbf{b}}\mathbf{a}$ on the graph below.



Part II - An Application

A parallelogram, which is not a rectangle, has three of its consecutive vertices given by A(1, 2, 4), B(2, 0, 5) and C(4, 6, 0). The line through the points A and E intersects the line through D and C at a right angle. Depending on the parallelogram and where the point E falls, there are three pictures possible.



1. Find the coordinates of the fourth vertex D of the parallelogram.

2. Find the coordinates of the point E.

3. Find the angles of the parallelogram.

4. Decide which of the three pictures is a correct representation.