Show absolutely all work (no scratch paper calculations omitted or mental calculations unreported) on this sheet in a clearly organized way, labeling problems, parts, and expressions (by their proper symbols). [Box] short final answers.

\[
\vec{b}_1 = (1, -2), \quad \vec{b}_2 = (1, 1), \quad \vec{v} = (1, 2), \quad \begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} = \frac{1}{ad-bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}.
\]

a) Make a diagram (label axes) of the vectors \( \vec{b}_1, \vec{b}_2, \vec{v} \) and including the parallelogram representing the projections along the axes of \( \vec{b}_1 \) and \( \vec{b}_2 \) of the vector \( \vec{v} \).

b) From your diagram, guess approximate (rough) values of the coordinate values \( y_1 \) and \( y_2 \) for \( \vec{v} \) expressed in the basis \( \{ \vec{b}_1, \vec{b}_2 \} \).

c) Now find these coordinates using either an inverse matrix or row reduction

\[
[\text{final answer: } y_1 = \ldots, y_2 = \ldots].
\]

d) How close was your guess? (Don't change your guess now!).

e) Now find the coordinates \( (y_1, y_2) \) of a general vector \( \vec{x} = (x_1, x_2) \) with respect to this basis.

\[
[\text{final answer: } y_1 = \ldots, y_2 = \ldots].
\]