Instructions: Show all work. Give exact answers unless specifically asked to round. Be sure to answer all parts of each question.

1. If $A = \begin{bmatrix} 2 & 0 & -1 \\ 3 & -4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ -7 & 0 \\ 3 & -2 \end{bmatrix}$, find:
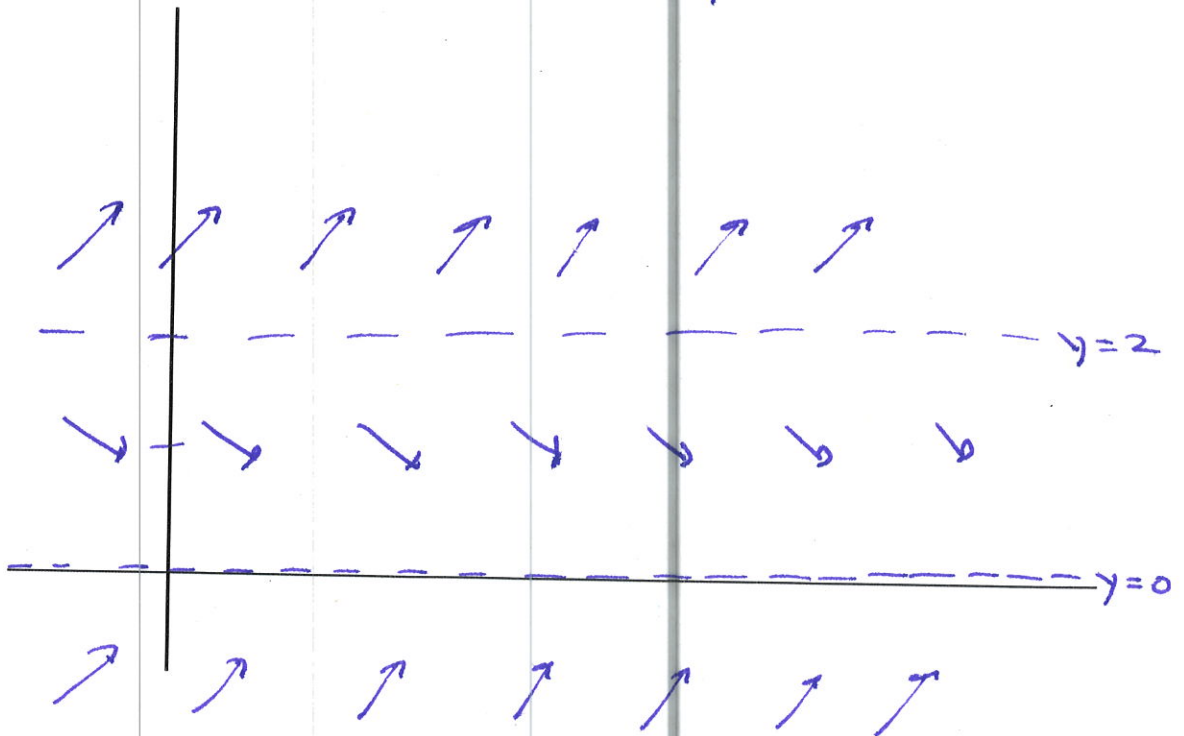
   a. A^T
   $$\begin{bmatrix} 2 & 3 \\ 0 & -4 \\ -1 & 5 \end{bmatrix}$$

   b. AB
   $$\begin{bmatrix} 2+0-3 & 6+0+2 \\ 3+28+15 & 9+0-10 \end{bmatrix} = \begin{bmatrix} -1 & 8 \\ 46 & -1 \end{bmatrix}$$

2. Draw the direction field for the autonomous equation $y' = y^2 - 2y$.

   $y(y-2)$

3. Use the direction field below to plot 4 trajectories from different initial conditions (forward and backward in time).