1. [12 points] Consider the system of differential equations $\mathbf{x}' = \begin{pmatrix} -2 & 0 & 0 \\ 0 & 1 & -2 \\ 0 & 3 & -4 \end{pmatrix} \mathbf{x}$.

a. [6 points] Find the general solution to this system.[1]

b. [6 points] Now suppose that we consider only initial conditions in the yz-plane (that is, we take $\mathbf{x}(0) = \begin{pmatrix} 0 \\ y_0 \\ z_0 \end{pmatrix}$). Sketch the phase portrait for these initial conditions, in the yz-plane.

[1] Possibly useful: $\det\left(\begin{pmatrix} a & 0 & 0 \\ 0 & b & c \\ 0 & d & e \end{pmatrix}\right) = a(be - cd)$.