Q1a: If we let $x_1 = x$ and $x_2 = x'$, the ODE $x'' + bx' + kx = 0$ will correspond to the matrix $A = \begin{pmatrix} 0 & 1 \\ -b & -k \end{pmatrix}$. The trace of A will be $-k$ and the determinant will be b. Therefore, we only concern ourselves with the subset of the trace-determinant plane where trace is negative and determinant is positive. The behaviour of the solution will change when $4b = k^2$. When we have $k < 4b^2$ solutions will look similar, and similarly for when $k > 4b^2$.