Homework 6

Due date: someday, sometime!
Submit on NYU Brightspace.

Exercise 1. [100 pts] For each of the following affairs, find the eigenvalues and eigenvectors, and sketch (by hand), qualitatively, all possible phase portraits (if applicable, depending on the signs and relative sizes of a and b). Do **NOT** use computer to make the plots. Specify the stability of the origin $[R, J] = [0, 0]$ (stable node, saddle point, center (for closed orbits), or stable/unstable spirals). Your sketches should show the important qualitative features of each case. Interpret the phase portraits.

(i) (35 pts) $\dot{R} = J,\ \dot{J} = -R + J$

(ii) (35 pts) $\dot{R} = aJ,\ \dot{J} = bR,\ (a, b \neq 0)$

(iii) (30 pts) $\dot{R} = aR + bJ,\ \dot{J} = bR + aJ,\ (a < 0,\ b > 0,\ a^2 = b^2)$

notes: Solutions without details of the work and interpretation of the results will not receive full credits.