Math 23 Diff Eq: Homework 6

due Wed Nov 9 ... but best if do relevant questions after each lecture

Hint: In several of these you are to plot the 'phase portrait' (motion in x_1-x_2 plane). This is easiest done with the Matlab tool `pplane7` or its online applet version; both are linked to from the course website. If you want to study $\mathbf{x}' = A\mathbf{x}$ with

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \tag{1}$$

then, since in `pplane7` the variables are called `x` and `y`, this can be achieved by entering `x' = a*x + b*y` and `y' = c*x + d*y`.

7.3: 4 (note this is similar to how you find eigenvectors for λ = eigenvalue), 6, 16 (interesting that a real matrix can have complex eigenvalues and vectors; note the conjugate pairing), 22 (easiest to use cofactor formula for $\det(A - \lambda I)$).

7.4: 2abc, 4 (remember $x_2^{(1)}$, or x_{21}, is second element of first solution vector. This question shows you 2nd-order and 1st-order-system Wronskians are just facets of the same thing!); 6 (b means to say 'in what time intervals').

7.5: 2, 13 (Hint: you could check your eigen-calculation by entering the matrix into Matlab with `A = [a b c; d e f; g h k]` then `[V,D]=eig(A)`, giving (normalized) eigenvectors in columns of `V` and eigenvalues on diagonal of `D`), 16, 25.

7.6: 1 (important to be able to do this), 17.

7.8: 1 (use `pplane7`), 2.

9.1: 4 (sketch $x_1(t)$ by hand by looking at `pplane7` output), 19.