1. Let $A$ be a self-adjoint matrix. Show that there is a self-adjoint matrix $B$ so that
\[ B^3 = A(A - 2I)(A - 3I) \]
What are the eigenvalues of $B$ in terms of the eigenvalues of $A$?
What are the eigenvectors of $B$ in terms of the eigenvectors of $A$?
Will $B$ commute with $A$?

2. Assume that $A$ is a symmetric matrix with eigenvalues not equal to 3.
True or false? The matrices $A(A - 2I)$ and $(A - I)(A - 3I)^{-1}$ commute.

3. Show that if $N$ is a normal matrix then $\|Nx\| = \|N^*x\|$ for all vectors $x$.

And from Strang, 3rd Ed. (Caution! this is the old edition, see the problems on Carmen),
p.319 solve: 5.3, 5.4, 5.5, 5.19, 5.20(a)(b).