(This is the coversheet for the homework. The problems refer to Anton and Rorres 10th ed. of *Elementary Linear Algebra: applications version.* See Problem Sets 1, 2 or 3 for further formatting.)

Problem 91 § 5.2 #2 (show the matrices are not similar)

Problem 92 § 5.2 #12 (diagonalize it)

Problem 93 § 5.2 #16 (diagonalize it?)

Problem 94 § 5.2 #17 (diagonalize it?)

Problem 95 For the problem(s) above which was(were) not diagonalizable, find a Jordan-basis and perform a similarity transformation to reveal the Jordan form of the given matrix. See § 6.4 of my lecture notes for related discussion.

Problem 96 § 5.2 #24c (computation of powers via diagonalization)

Problem 97 Solve $d\vec{x}/dt = A\vec{x}$ for A given in problems 92, 93, 94. This should not require much, if any, computation. You need only understand § 6.5.1 or perhaps it's better to read Chapter 8 of my notes. For the impatient reader, § 8.4 has the examples you desire.

Problem 98 § 5.3 #18 (complex e-vectors)

Problem 99 § 5.3 #24 (similarity transformation to scale/rotation matrix C)

Problem 100 § 5.3 #29 (but, let's be smart about this, use blocks and start by studying products of the 2×2 Pauli matrices)

Problem 101 Solve $d\vec{x}/dt = A\vec{x}$ for A given in problems 98, 99. This should not require much, if any, computation. You need only understand § 8.5 my notes.

Problem 102 § 5.4 #3 (system of differential equations with initial conditions)

Problem 103 Suppose A, B are square matrices which are both diagonalizable. Furthermore, suppose you wish to diagonalize both of them with the same similarity transformation P. Let's say $P^{-1}AP = D_A$ and $P^{-1}BP = D_B$ where D_A and D_B are diagonal matrices. **What condition must hold for the commutator $[A, B] = AB - BA$ in order that the simultaneous diagonalization is possible?**

note: in quantum mechanics this math explains why we cannot simultaneous measure position $\mathbf{x}$ *and momentum* $\mathbf{p}$. *A simple calculation shows* $[\mathbf{x}, \mathbf{p}] = i\hbar$. *This is the source of Heisenberg's uncertainty principle. I mention some tidbits about quantum mechanics because some of you aspire to be electrical engineers and quantum mechanics is relevant to many circuits designed today... who knows what awaits you in your career.*