(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 116 § 6.5 # 2 (least squares fit)

Problem 117 § 6.5 # 4 (least squares fit)

Problem 118 § 6.5 # 8 (least squares fit)

Problem 119 § 6.6 # 2 (Fourier series)

Problem 120 § 6.6 # 4 (Fourier series)

Problem 121 § 7.1 #2 (verify orthogonal matrix induces length-preserving map)

Problem 122 § 7.2 #2 (symmetric matrix, find orthonormal e-basis to diagonalize)

Problem 123 § 7.2 #6 (symmetric matrix, find orthonormal e-basis to diagonalize)

Problem 124 § 7.2 #16 (find the spectral decompositions)

Problem 125 § 7.2 #20 (notice, all you have to do is show the given formula is symmetric and guess the eigenvectors which have those values... it's not that hard, just think)

Problem 126 § 7.3 # 6 (change coordinates which remove the cross-terms)

Problem 127 § 7.3 # 14 (identify conic by proper choice of coordinates)

Problem 128 § 7.3 # 16 (identify conic by proper choice of coordinates)

Problem 129 § 7.3 #28 (choose k to make the quadratic form positive definite)

Problem 130 § 7.4 #2 and 4 (find min/max of a quadratic form on the unit-circle)

Problem 131 § 7.4 #6 (find min/max of a quadratic form on the unit-sphere)

Note: there is much more to say about § 7.4 of Anton, I cut short the homework here and leave the rest for the Advanced Calculus course where we have partial derivatives and the general theory of differentiation at our disposal. In short, at a critical point we can approximate a mapping by a quadratic form. The eigenvalues reveal the local behaviour of the function. This is how the Hessian Theorem is derived. You might note that Anton takes the 2nd derivative test as a given and derives algebraic consequences. I prefer the view that algebra gives us the 2nd-derivative theorem modulo a few analytical details. I derive the 2nd derivative theorem from the Method of Lagrange Multipliers paired with the multivariate Taylor Theorem in my Math 231 notes. In any event, I hope you enjoyed this semester. Now, go finish the Matlab you've put off all these many weeks!