(This is the coversheet for the homework. The actual solutions should be worked out neatly on single-sided with each problem labeled (for example: Problem 1, 1.1 #14) and the answer boxed. Those additional sheets are then to be stapled with a metal staple in the upper left corner in such a way that no work is obscured. Failure to follow the style outlined here will result in a loss of credit. The problems refer to Anton and Rorres 10th ed. of *Elementary Linear Algebra: applications version.*)

Problem 1 § 1.1 # 14 (augmented matrix for system linear eqns.)

Problem 2 § 1.2 # 6 (solve via Gauss-Jordan elimination)

Problem 3 § 1.2 # 8 (solve via Gauss-Jordan elimination)

Problem 4 § 1.2 # 30 (solve system in terms of unknown constants a, b, c)

Problem 5 § 1.3 # 6 (computation of transpose, sum, difference and products and trace)

Problem 6 § 1.3 # 10a (matrix-vector product as linear combination)

Problem 7 § 1.3 # 12 (matrix notation for system of linear eqns.)

Problem 8 Let $A, B \in \mathbb{R}^{n\times n}$. Let $trace(A) = \sum_{i=1}^{n} A_{ii}$.

- **a.** If $c \in \mathbb{R}$, show $tr(A + cB) = tr(A) + ctr(B)$.
- **b.** show that $trace(AB) = trace(BA)$.
- **c.** let $[A, B] = AB - BA$, show $trace([A, B]) = 0$.
- **d.** can $[A, B] = I$?

****please use technology to compute matrix operations in the problems that follow.****

Problem 9 § 1.2 # 34 (substitution to make linear)

Problem 10 Find a cubic polynomial whose graph contains the points $(1, 2)$, $(2, 2)$, $(3, 2)$ and $(4, 2)$.

Problem 11 § 1.2 # 38 (circles that fit the triple of points, find all solutions, answer has parameter)

Problem 12 A **probability vector** has entries whose sum is one. A **stochastic matrix** is a square matrix whose columns are probability vectors. Let $A = \begin{bmatrix} .85 & .03 \\ .15 & .97 \end{bmatrix}$ be a stochastic matrix which models the migration of people to and from the city to the suburbs. In particular, if c_k denotes the number of people (in thousands) in the city in year k and s_k denotes the number of people (in thousands) living in the suburbs in year k then letting $X_k = [c_k, s_k]^T$ we can model the migration of people by the following matrix product:

$$X_{k+1} = AX_k.$$

This model assumes the population stays constant and that there are only two places to live, the city or the suburbs. In addition, the model says that 15% of city people move to suburbs while only 3% of the suburb people move to the city. Suppose that $X_0 = [400, 300]^T$ represents the population in 2000. **Calculate the number of people living in the city and the number of people in suburbs in the years 2001, 2002, ... 2012. Give your answer in a table.**