

M346 (55820), Homework #3

Due: 12:00pm, Wednesday, Feb. 08

*Instructions: Questions are from the book "Applied Linear Algebra, 2nd ed." by Sadun. Please show all your work, not only your final answer, to receive credit. Keep answers organized in the same order the problems have been assigned.*

**Linear transformations and operators (3.1)**

p. 41-42, #2, 3, 6, 7

**Matrix representation (3.2)**

p. 47-48, #3, 4, 5, 9, 10, 11

**Effect of a change of basis (3.3)**

p. 50, #3, 4, 5, 6, 7

**Kernel and range (3.5)**

p. 56, #4, 5, 7, 8, 9

In addition:

A) Does the nonhomogeneous equation

$$tp''(t) - p(t) = q(t)$$

have solutions  $p(t) \in \mathbb{R}_n[t]$  for every  $q(t) \in \mathbb{R}_n[t]$ ? Are there nontrivial (i.e., nonzero) solutions in  $\mathbb{R}_n[t]$  to the homogeneous equation  $tp''(t) - p(t) = 0$ ? Use the Fredholm alternative to justify your answer.