

Math 3592 review for exam 3

This sheet is supposed to help you by providing some extra practice. It should not be interpreted that what is on this sheet is the only practice you should do, or that questions like the ones here are the only kind you will be asked. You are advised to review the material we have covered more broadly than what is on this sheet.

1. Find a basis for the vector space which is the intersection in \mathbb{R}^4 of the hyperplanes $w + x + y + z = 0$ and $w + 2x + 3y + 4z = 0$.

There are more questions like this in 2.5.6 and 2.5.7 and 2.5.9.

2. True or false: a vector subspace of \mathbb{R}^7 defined by the simultaneous vanishing of 3 linear expressions can have dimension (a) 2, (b) 6.
3. True or false: Suppose $AB = I$ is an identity $n \times n$ matrix. Then
 - (a) the columns of B are linearly independent;
 - (b) the rows of B are linearly independent;
 - (c) for every vector b there is always a solution to $Bx = b$;
 - (d) for every vector b there is at most one solution to $Bx = b$;
 - (e) for every vector b there may be infinitely many solutions to $Bx = b$;
 - (f) B has n independent rows where I is $n \times n$.
 - (g) the rank of B is n .
 - (h) the nullity of B is 0.
 - (i) the rank of B plus the nullity of B is n .

[Here 'true or false' means you check true if the option is a correct mathematical statement, false if it is an incorrect mathematical statement.]

There are more questions like this in 2.5.2, 2.5.3 and 2.5.8 on page 208.

4. Find the inverse of $\begin{pmatrix} 2 & 1 & 3 \\ 2 & 1 & 2 \\ 3 & 1 & 4 \end{pmatrix}$.

5. Which are linear maps $P^k \rightarrow P^k$?:

- (a) $T(f) = f'' + f$
- (b) $T(f) = f'' + x$
- (c) $T(f) = 0$
- (d) $T(f) = xf'' + f$
- (e) $T(f) = \int_0^x f(t) dt$
- (f) $T(f) = f \int_0^1 f(t) dt$

6. Find a basis for \mathbb{R}^4 which includes the vectors $(1, 0, -1, 0)$ and $(0, 1, 0, 1)$.