Math 232, Spring 2007
Second Midterm

March 5, 2007, 11:30 – 12:20

Last Name:	
First Name:	
SFU ID:	

1. DO NOT LIFT UP THE COVER PAGE UNTIL INSTRUCTED.
2. No calculators are allowed.
3. This test is comprised of 7 pages (including cover page)
4. Once the test begins, please check that all pages are intact.
5. Do ALL questions.
6. Clearly explain your answer. No credit will be given for just writing down the answer.
7. If the answer space provided is not sufficient, write your answer on the back of the previous page. Clearly mark the question number.
8. All the best.

Question	Points	Score
1	3	
2	5	
3	7	
4	7	
5	10	
Total:	32	

1. (3 points) Compute the determinant of the following matrix. Show your work.

$$\begin{pmatrix} 2 & 0 & 1 \\ 1 & 2 & -1 \\ 3 & 1 & 2 \end{pmatrix}$$

Answer

2. (a) (2 points) Let c be a real number. Compute the determinant of the matrix

$$A = \begin{pmatrix} 0 & 0 & 1 \\ 1 & c & 0 \\ 1 & 1 & c \end{pmatrix}$$

Answer

(b) (3 points) For which values of c is A invertible? Give a formula for A^{-1} that is valid for those values of c.

Answer

3. Consider the matrix

$$A = \begin{pmatrix} 2 & 1 & 1 & 4 \\ 1 & 1 & 0 & 3 \\ 1 & 2 & -1 & 5 \end{pmatrix}$$

(a) (3 points) Find a basis for Nul(A)

Answer

(b) (3 points) Find a basis for Col(A)

Answer

(c) (1 point) What is the rank of A?

Answer

4. We consider the subset

$$H = \{f(t) \in \mathbb{P}_3 : f(-t) = f(t)\}$$

   (a) (1 point) What properties should H satisfy to be a subspace of $\mathbb{P}_3$?

Answer

   (b) (3 points) Prove that H is a subspace of $\mathbb{P}_3$.

Answer

   (c) (3 points) Give a basis of H. Explain why your answer is correct.

Answer

5. Consider the subspace

$$H = \left\{ \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} : \mathbb{R}^3 : x_1 + x_2 = x_3 \right\}$$

(a) (3 points) Show that $\mathcal{B} = \left\{ \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix} \right\}$ is a basis for H.

Answer

(b) (2 points) Describe in words what the coordinate vector $[\mathbf{v}]_{\mathcal{B}}$ of a vector $\mathbf{v} \in H$ is.

Answer

(c) (3 points) Let $\mathbf{c}_1 = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}, \mathbf{c}_2 = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}$. Compute $[\mathbf{c}_1]_{\mathcal{B}}$ and $[\mathbf{c}_2]_{\mathcal{B}}$.

Answer

(d) (2 points) Let $\mathcal{C} = \{\mathbf{c}_1, \mathbf{c}_2\}$. Compute $P_{\mathcal{B} \leftarrow \mathcal{C}}$.

Answer