Math 320 R. Jones
Spring 2007 April 16, 2007

Exam 2

Name:

Section Time: Tues 8:50 Tues 9:55 Thurs 8:50 Thurs 9:55

You are allowed one side of one sheet of paper of notes on this exam.

You must show all your work, and explain your reasoning to receive credit for your answers.

These problems are NOT arranged in ascending order of difficulty. Work them in an order that will maximize your score. If you need more space, use the back of the page. *Good luck!*

Problem	Score	Problem	Score
1		5	
2		6	
3			
4		Total	

1. [15 points] Find the determinant of the following matrix:

$$\begin{bmatrix} 2 & -4 & 2 \\ 3 & 4 & 4 \\ -4 & 6 & 5 \end{bmatrix}.$$

2. [15 points] Let $\vec{v_1} = \begin{bmatrix} 12 \\ -1 \\ 2 \\ 1 \end{bmatrix}$, $\vec{v_2} = \begin{bmatrix} -2 \\ -1 \\ 1 \\ 0 \end{bmatrix}$, and $\vec{v_3} = \begin{bmatrix} 8 \\ -3 \\ 4 \\ 1 \end{bmatrix}$.

   Determine whether $\vec{w} = \begin{bmatrix} 3 \\ 2 \\ 2 \\ 1 \end{bmatrix}$ is in the span of $\{\vec{v_1}, \vec{v_2}, \vec{v_3}\}$.

3. [15 points] Let $\vec{v_1}, \vec{v_2}, \vec{v_3}$ be as in problem 2. Determine whether $\{\vec{v_1}, \vec{v_2}, \vec{v_3}\}$ are linearly independent.

4. [20 points] Let S be the set of all vectors $\vec{v} = (x, y, z)$ in $\mathbb{R}^3$ such that $2x - y - z = 0$.

   (a) Determine whether S is a subspace of $\mathbb{R}^3$. Be sure to fully justify your answer.

   (b) Find a basis for S and say what the dimension of S is and why.

5. [15 points]

   (a) Show that the three functions $f_1 = 1, f_2 = x, f_3 = e^x$ are linearly independent.

   (b) Find a third-order DE that the three functions in part (a) are all solutions to.

   (c) Write the general solution to the DE you found in part (b). Be sure to say explicitly why it is the general solution, i.e. why every solution can be written in this form.

6. [20 points] Solve the following initial value problem: $y^{(3)} + 2y'' - 20y' + 24y = 0$, $y(0) = 9, y'(0) = 1, y''(0) = 32$. [Hint: one solution to the DE is $y = e^{2x}$].