

Name: _____

Math 254 Fall 2011 Exam 1

Please read the following directions:

Books, notes, calculators, and other aids are not permitted on this exam. Please write legibly, with plenty of white space. Please put your answers in the designated areas. Show all necessary work in your solutions; if you are unsure, show it. Cross out work you do not wish graded; incorrect work can lower your grade. All problems are worth 5-10 points; your total will be scaled to the standard 100 point scale. You have approximately 30 minutes.

Extra credit may be earned by handing in revised work in class on Friday 9/16; for details see the syllabus. You will find this exam on the instructor's webpage later today.

1. Carefully state the definition of “subspace”. Give two examples in \mathbb{R}^2 .

2. Let $u = [5 \ 6 \ 12]$, and $v = \begin{bmatrix} 4 \\ 0 \\ -2 \end{bmatrix}$. For each of the following, determine what *type* they are (undefined, scalar, matrix/vector). For each matrix/vector, specify the dimensions.
DO NOT CALCULATE ANY NUMBERS.

Example: $3v$. This is a 3×1 matrix (or column 3-vector).

1. $(u + v^T)^T$

2. uvu

3. u^Tvu

4. $u \cdot (u \times v)$

5. $u \times (u \cdot v)$

3. Let $u = (1, 1, -1)$, $v = (4, 5, 10)$. Determine, with justification, whether these vectors (in \mathbb{R}^3) are orthogonal.

4. For $A = \begin{bmatrix} 0 & 1 & 2 \\ -2 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 0 \\ 1 & -1 \\ 0 & 1 \end{bmatrix}$, calculate AB and BA .

5. For $\bar{u} = (1, 1, -1)$ and $\bar{v} = (2, -1, 0)$, find $\bar{u} \times \bar{v}$ and $\bar{v} \times \bar{u}$.