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## Math 254 Fall 2014 Exam 1

Please read the following directions:

Please print your name in the space provided, using large letters, as “First LAST”. 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 Wednesday 9/10; for details see the syllabus. You will find this exam on the instructor’s webpage later today.

1. Carefully state the definition of “polynomial space in  $s$ ”. Give a set of two vectors, drawn from  $P_1(s)$ .

2. Let  $u = [2 \ 17 \ -1]$ . For each of the following, specify what type of object  $v$  must be for the expression to be defined. If the expression can never be defined, write NONE.

SAMPLE QUESTION:  $u + v$ . This has three answers, any one of which is correct:

SAMPLE ANSWER: (1) row 3-vector; or (2) row vector from  $\mathbb{R}^3$ ; or (3)  $1 \times 3$  matrix.

1.  $u^T v + uv^T$

2.  $u \cdot v$

3.  $u \times v$

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

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

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3. Let  $A = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ ,  $B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ . Compute  $ABA^T$ .

4. Let  $u = (1, 0, -1)$ ,  $v = (0, 2, 3)$ . Calculate  $u \times v$ .

5. Let  $u = (1, 2, 3)$ ,  $v = (x, y, 0)$ . Find values for  $x, y$  such that  $u, v$  are orthogonal *and also* simultaneously  $\|v\| = 1$ .