

**Second Exam**

*Tuesday, July 11, 2017*

This exam is closed book, but you may use calculators that do not have computer algebra systems. Make sure your name is on all pages. Show all work, and show it in a logical and organized manner: You will be graded on what you show, in addition to your answer. Check your work carefully. Each entire problem is worth 25 points.

1. Given  $u = [-1, 0, 1]^T$ ,  $v = [2, 3, 2]^T$ , and  $w = [1, 1, 1]^T$ , compute the following.

$$(a) v - 2w \qquad (b) \|u - v\| \qquad (c) \|3u - 3v\|$$

$$(d) u \circ (5v) \qquad (e) (5u) \circ v \qquad (f) (u - v) \circ (u - v)$$

2. With  $u$ ,  $v$ , and  $w$  as in Problem 1, compute the following.

(a) The projection of  $u$  onto  $w$ .

(b) The projection of  $w$  onto  $u$ .

(c)  $u \circ (v \times w)$ .

3. Consider the points  $P = (1, 0, -1)$ ,  $Q = (0, 1, -1)$ , and  $R = (1, 0, 1)$ .

(a) Write down a single equation, relating  $x_1$ ,  $x_2$ , and  $x_3$ , for the plane through these three points. Simplify the equation to standard form.

(b) Write down parametric equations for the plane through these three points.

4. Write down a vector equation (with parameters) for the solution set to

$$\begin{array}{rccccrcr} x_1 & + & 2 & x_2 & + & 3 & x_3 & + & 4 & x_4 & = & -1 \\ & & & x_2 & & & & & + & x_4 & = & 1 \\ x_1 & & & & + & 3 & x_3 & + & 2 & x_4 & = & -3 \end{array}$$