Assignment #4

Due on Monday, September 21, 2009

Read Chapter 2 on *Vector Algebra* in Bressoud (pp. 29–49).

Do the following problems

1. Exercise 19 on page 51 in the text.

2. Exercise 20 on page 51 in the text.

3. Exercises 22 and 23 on page 51 in the text.

4. In this problem and the next, we derive the vector identity

$$u \times (v \times w) = (u \cdot w)v - (u \cdot v)w$$

for any vectors u, v and w in $\mathbb{R}^3$.

   (a) Argue that $u \times (v \times w)$ lies in the span of v and w. Consequently, there exist scalars t and s such that

   $$u \times (v \times w) = tv + sw$$

   (b) Show that $(u \cdot v)t + (u \cdot w)s = 0$.

5. Let u, v and w be as in the previous problem.

   (a) Use the results of the previous problem to conclude that there exists a scalar r such that

   $$u \times (v \times w) = r[(u \cdot w)v - (u \cdot v)w].$$

   (b) By considering some simple examples, deduce that $r = 1$ in the previous identity