

## Quiz 2

Math 53, section 213

September 15, 2014

1. Find two unit vectors orthogonal to both  $\langle 3, 2, 1 \rangle$  and  $\langle -1, 1, 0 \rangle$ .

**Solution:** The cross product of the two vectors is  $\langle 1, 1, -5 \rangle$ , so this vector is orthogonal to both. To make it a unit vector, we can divide by its length,  $3\sqrt{3}$ , to get that  $\langle \sqrt{3}/9, \sqrt{3}/9, -5\sqrt{3}/9 \rangle$  is a unit vector orthogonal to both the original vectors. To obtain another such vector we may simply negate this unit vector to obtain  $\langle -\sqrt{3}/9, -\sqrt{3}/9, 5\sqrt{3}/9 \rangle$ , which is another unit vector orthogonal to both  $\langle 3, 2, 1 \rangle$  and  $\langle -1, 1, 0 \rangle$ .

2. Find an equation describing the plane passing through the point  $(1, -1, -1)$  and parallel to the plane  $5x - y - z = 6$ .

**Solution:** The planes parallel to  $5x - y - z = 6$  can all be written in the form  $5x - y - z = a$  for some constant  $a$ , since they must have the same normal vector  $\langle 5, -1, -1 \rangle$ . The value of  $a$  for which the plane passes through  $(1, -1, -1)$  is  $a = 7$ . Therefore the equation of this plane is

$$5x - y - z = 7.$$