Math 217 Assignment 1

This assignment is due in class on Thurs. Sept. 13.

1. An ant is walking due east at a constant speed of 2 km/hr on a sheet of paper that rests on a table. Suddenly the sheet of paper starts moving southeast at $\sqrt{2}$ km/hr. Find the velocity of the ant relative to the table.

2. Sec 11.2 #58

3. A 500 kg weight hangs from four identical cables of equal length that are anchored at the points $(\pm 2, 0, 0)$ and $(0, \pm 2, 0)$. The load is located at $(0, 0, -4)$. Find the smallest load capacity for each cable if the cables are to hold the 500 kg. weight

4. Sec 11.3 #16

5. Let $\ell$ be the line $y = 3x$ and $v = (3, 2)$. The distance from $\ell$ to $v$ is the shortest distance from a point on $\ell$ to $v$.
   (a) Find a unit vector $u$ lying on $\ell$.
   (b) Prove that $\text{proj}_u v$ is the closest point on $\ell$ to $v$. Hint: Show that $v - \text{proj}_u v$ is orthogonal to $u$. Now draw a good picture.
   (c) Find the distance from $\ell$ to $v$.

6. Sec. 11.4 #32