Ungraded Quiz + Questionnaire 3

Your name: __________

April 18, 2014

1. If V is a vector space and $H \subset V$ is a subspace, can you always subtract vectors in H? That is, if $u, v \in H$, does $u - v \in H$? Why? **Yes**. If $u, v \in H$, then $-v \in H$. Then we have $u + (-v) = u - v \in H$.

2. True or false: the determinant of a matrix does not change after your perform elementary row operations. **False**. It changes after an interchange or a row scaling (if the determinant is nonzero).

3. Let $V = \mathbb{R}^2$ and consider $H = \{(x, y) \in V | xy = 0\}$. Sketch H. Is H a subspace of $\mathbb{R}^2$?

A vector $v \in \mathbb{R}^2$ belongs to H if at least one of its coordinates is 0. If you sketch V then you get exactly the x- and y-*axes*. The subspace H does not equal the whole plane: $(1, 1) \in V$ but $(1)(1) \neq 0$, so that $(1, 1) \notin H$. H is **not a subspace** of $\mathbb{R}^2$: while it contains the zero vector and is closed under scalar multiplication ($(cx)(cy) = 0$ for any scalar c if $xy = 0$), H is not closed under addition. That is, you can write down a pair of vectors in H whose sum is not in H. The two standard basis vectors, for example: $(1, 0)$ and $(0, 1)$ both lie in H, as $(1)(0) = 0 = (0)(1)$. But their sum is $(1, 1)$, which does not lie in H.