1. 5.15

2. 5.16 (Read Def. 5.45 first)

3. 5.17

4. 5.18

5. 5.19

If you have not seen the definition of quotient of vector space by a subspace, it's not a hard concept. Given a vector space X and a subspace W we say $x \sim z$ if $x - z \in W$, or alternatively if $x = z + w$ for some $w \in W$. It's easy to see that this is an equivalence relation and we write the equivalence class of x as $x + W$ rather than $[x]$. We define $(x + W) + (z + W)$ by $(x + z) + W$ and $\alpha(x + W) = \alpha x + W$. You should show that these operations are well defined as a preamble to starting 5.19. With these operations, the set of equivalence classes, written X/W, is a vector space, though you do not need to prove this.

6. 5.22 (We sketched this in class; write the details down.)