Math 4550 Hints for questions for Feb. 10, 2009

1. Be careful. For instance, you might try to show that if y_i is a sequence of elements in P which converge to y and each $y_i = c_1x_1 + \cdots + c_nx_n$ is a convex combination of the x_j which define P, then the limit must be in P. However, the nonuniqueness of this sum may cause a problem. One way around this is to use problem 4 from hw 2 and....

2. Since a is in the interior of K there is an $r > 0$ so that the open ball $B_r(a)$ is in K. As K is convex and $b \in K$.....

3. Lots of things to think about. Here are two: 1) Since each H_ε can be written as $H_\varepsilon = \{y : a_\varepsilon \cdot y = b_\varepsilon, a_\varepsilon \in (\mathbb{R}^d)^\star, b \in \mathbb{R}\}$ one could hope that $H_\varepsilon \to H$ means that $a_\varepsilon \to \varepsilon$ and $b_\varepsilon \to b$ where $H = \{y : a \cdot y = b.\}$ But to use this idea you will have to do something a little bit more careful. For instance, if $H = H_\varepsilon$ for all ε it would not imply that $a_\varepsilon \to a$ or $b_\varepsilon \to b$ as H can be written in too many different ways. 2) Don't think that just because the line segments are getting shorter the H_ε's must converge. For instance, suppose that $K \subseteq \mathbb{R}^2$ and the endpoints in K closest to x got closer and closer, but spun around x faster and faster. Then the $H_\varepsilon' s$ would not have a limit. Of course this is impossible since K is convex and even in this case there is a subsequence of the H_ε's which do converge....

4. Induction on m.

5. How many triangles is each edge in?