HOMEWORK 2 FOR 18.726, SPRING 2015
DUE FRIDAY, FEBRUARY 20 BY 3PM.

(1) # 3.5
(2) # 3.13(f).
(3) # 3.8
(4) Let M be the submonoid in $\mathbb{Z}^2$ generated by $(0,1)$, $(2,1)$, $(3,1)$. Let k be a field. Let $X = Proj(k[M])$ and Y be its normalization. Show that the map $Y \to X$ is a homeomorphism but is not an isomorphism.
(5) (Optional bonus problem). Let A be a finitely generated commutative ring over a field k. Let $d = \dim(Proj(A))$. Show that for some constants $c_1, c_2 > 0$ we have $c_1 n^{d+1} \leq \dim(A^{\leq n}) \leq c_2 n^{d+1}$ for all $n > 0$.