

Math 553, Lesieutre  
Problem set #5  
due February 19, 2016

1. Use the valuative criterion of separatedness to show that the affine line with doubled origin is not separated (explain how to actually get all the maps of schemes involved!)
2. Use the valuative criterion of properness to show that  $\mathbb{A}^1$  is not proper.
3. Show that any closed immersion is proper.
4. II.4.6
5. II.5.1
6. II.5.5
7. Show that if  $\mathcal{F}$  and  $\mathcal{G}$  are locally free sheaves,  $\mathcal{F} \otimes \mathcal{G}$  is locally free. Identify the sheaf  $\mathcal{O}_{\mathbb{P}^n}(a) \otimes \mathcal{O}_{\mathbb{P}^n}(b)$ .