

1. Hartshorne: chapter II, Exercise 7.8
2. (optional) Hartshorne: chapter II, Exercise 7.9
3. Find the blow up of  $Y$  at the closed subscheme  $X$  in the following cases:
  - a)  $Y = \text{Spec } \mathbb{C}[x, y]$  and  $X$  is given by the ideal  $(x^2, y)$ ,
  - b)  $Y = \text{Spec } \mathbb{C}[x, y, z]/(z^2 - xy)$  and  $X$  is given by the ideal  $(y, z)$ .

In each case cover  $Bl_X Y$  by two open affine subschemes and show how they glue together. Find the equation of the exceptional divisor in each open affine. Find  $P_X Y$  (projective normal cone) in each case and compare it to the exceptional divisor.

4. Let  $B = \mathbb{C}[x, y]/(y^2 - x^3)$ . Calculate  $\Omega_{B/\mathbb{C}}$  and show that it is a  $B$ -module with torsion.