

## MATH 216B HOMEWORK 3

SPRING 2004

- (1) Let  $\sigma = \text{pos}((1, 0, 0), (1, 2, 0), (1, 1, 2), (1, 0, 2))$ . Which Weil divisors on  $U_\sigma$  are Cartier? Compute Pic and  $A_2$  for this toric variety.
- (2) Give two examples to show that if  $X_\Delta$  is not smooth, then  $A_{n-1}$  may have torsion, but also could still be torsion-free. What is the criterion for  $A_{n-1}$  to be torsion-free?
- (3) Recall that if  $X_\Delta$  is a smooth toric variety, to blow-up the distinguished point  $x_\tau$  on  $X_\Delta$  we take the stellar subdivision of  $\tau$  (by adding the ray  $\sum_{v_i \in \tau} v_i$ ). What does the blow-up do to  $A_{n-1}$ ?
- (4) Show that any two-dimension complete toric surface is projective. Bonus: Check that every ample divisor on such a variety is very ample.
- (5) Let  $\Delta$  be the fan with rays  $\{(3, -1, 1), (0, 1, 0), (0, 0, 1), (-1, 0, 0), (1, 0, 0)\}$  and cones  $\{124, 125, 134, 135, 234, 235\}$ . Give an explicit description of the ample cone of  $X_\Delta$ .