

1 Vakil Exercise 21.4.A What is the degree of the invertible sheaf $\Omega_{C/k}$?

2 Vakil Exercise 21.4.B Show that $h^0(C, \Omega_{C/k}) = g$ as follows.

(a) Show that $\frac{dx}{y}$ is a (regular) differential on $\text{Spec } k[x, y]/\langle y^2 - f(x) \rangle$ (i.e., an element of $\Omega_{(k[x, y]/\langle y^2 - f(x) \rangle)/k}$).

(b) Show that for $0 \leq i < g$, $x^i(dx)/y$ extends to a global differential ω_i on C (i.e., with no poles).

(c) Show that the ω_i ($0 \leq i < g$) are all linearly independent differentials.

(d) Show that the ω_i form a basis for the differentials.

3 Gathmann Exercise 7.8.7

4 Gathmann Exercise 7.8.8