

1. Let  $p$  prime. What is the irreducible polynomial of the primitive  $p$ th root of unity  $\zeta_p := e^{2\pi i/p}$  over  $\mathbb{Q}$ ?

2. What is the irreducible polynomial of  $\zeta_8$  over  $\mathbb{Q}$ ?

3. What is the irreducible polynomial of  $\zeta_8$  over  $\mathbb{Q}(\zeta_3)$ ?