

Factor  $f$  into irreducibles, and find a splitting field and its degree over  $\mathbb{Q}$ .

1.  $f(x) = x^2 + 3x + 1$

2.  $f(x) = x^3 + 3$

3.  $f(x) = x^5 + x^3 + x^2 + 1$