

**Spring 2019, Math 320: Week 10 Preliminary Problems**  
**Due: Thursday, April 11, 2019**  
**Polynomial Factorization and Irreducibility**

**Preliminary problems.** These problems should be completed before discussion on Thursday.

(P1) Find all roots of the polynomial  $f(x) = 3x^2 + 6$ , where

(a)  $f(x) \in \mathbb{Z}_2[x]$ . (Note: in this case  $f(x)$  is identical to  $x^2 + 0$ .)

(b)  $f(x) \in \mathbb{Z}_5[x]$ .

(c)  $f(x) \in \mathbb{Z}_6[x]$ .

(d)  $f(x) \in \mathbb{Q}[x]$ .