

## 23 Chapter: Geometric Constructions

### *Exercises*

23.1 Use **GAP** to determine whether or not  $8x^3 + 4x^2 - 4x - 1$  is irreducible. Note that  $8 \cos^3(2\pi/7) + 4 \cos^2(2\pi/7) - 4 \cos(2\pi/7) - 1 = 0$ . Use these two facts to help you show that a regular seven-sided polygon is not constructible with a straightedge and compass. [Gallian, Chapter 23, Exercise 14]

23.2 Use **GAP** to determine whether or not  $4x^2 + 2x - 1$  is irreducible. Note that  $4 \cos^2(2\pi/5) + 2 \cos(2\pi/5) - 1 = 0$ . Use these two facts to help you show that a regular pentagon is constructible with a straightedge and compass. [Gallian, Chapter 23, Exercise 18]

23.3 Use **GAP** to verify that  $8x^3 - 6x - 1$  is irreducible over  $\mathbf{Q}$ . (This fact can be used in the proof that a 60 degree angle can not be trisected using only a straightedge and compass.) [Gallian, Chapter 23]