5. Monopoly
See Varian Ch 14.

I. Monopoly vs. Competition

A. The core behavioral rule is just the same...

1. The firm maximizes profit.

$$\max py - c(y)$$

B. The resulting decision rule is the same...

1. The firm still sets marginal revenue equal to marginal cost.

C. But the things the firm has control over have now changed...

1. We no longer assume that the firm is a price taker.
   a. Mathematically, this means that there is some functional relationship between the quantity the monopolist produces and the price the monopolist can charge.
   b. The firm's problem is now subtly different:

$$\max p(y)y - c(y)$$

   c. In particular, marginal revenue is not pegged to some exogenously given price.

II. The Monopolist's Problem

A. The real differences between monopolists and competitive firms comes on the revenue side.

1. When a competitive firm decides to change output, she only has to think about one effect.
   a. Revenue increases by $p\ dy$
2. Monopolists have to trade off two effects:
   a. Revenue *increases* by $p\ dy$.
   b. In order to sell more units, the monopolist has to lower price.
      - Revenue *decreases* by $ydp = y\frac{\partial p}{\partial y}dy$
      - Unless the monopolist can price discriminate, this revenue change affects all of the monopolist's units – not just the marginal ones.
      - These non-marginal units are called inframarginal.
3. Summing these effects we get an expression for marginal revenue: $pdy + ydp = [p + \frac{\partial p}{\partial y}y]dy$

B. Profit Maximization

1. The first order condition for the firm's problem sets marginal revenue equal marginal cost.

   $p(y) + p'(y)y = c'(y)$

2. We can rewrite this in terms of elasticities!

   $p(y)[1 + \frac{1}{\epsilon(y)}] = c'(y)$

   Ex: From FOC to elasticity expression.
   Ex: The linear case.
   Ex: Const Elastic Demand

3. $|\epsilon(y)| > 1$ at the Monopolist's production.
   a. Otherwise we'd have negative MR, which implies that reducing production increases profit.

III. Deadweight Loss

A. When firms are competitive, marginal costs of production equal (inverse) demand.

1. Marginal revenue is wherever the supply curve happens to intersect the demand curve.
2. This is a consequence of the price taking assumption.

B. If demand slopes downward, the monopolist's marginal revenue curve will lie below the demand curve.

   $p(y) > p(y)[1 + \frac{1}{\epsilon(y)}]$

1. A monopolistic industry therefore will produce at a lower level than a competitive one!

C. Competitive firms produce TS-max level and therefore monopoly power *must result in deadweight loss.*

1. An important caveat is that price discrimination can actually reverse this effect.

Ex: Quasilinear case.

IV. Passing Along Taxes (and Other Costs)

A. What happens to prices if the costs of production change?

B. To make things simple, we assume linear costs.

1. This is a very common assumption in industrial organization.
2. In this case it makes it easy to substitute cost increases for tax increases.

C. In this case it can be shown that

$$\max \frac{\partial p}{\partial c} = \frac{1}{2+yp''(y)/p'(y)}$$

Ex: Passing along costs

D. Meaning...

1. With linear demand, half of costs are passed on in the price.
2. With CE demand, price goes up *even higher than the increase in cost!*

V. Where Do Monopolies Come From?

A. Natural Monopolies

1. A natural monopoly is an industry with a cost structure that prohibits marginal cost pricing.
   a. Competitive production and pricing would lead to negative profits.
   b. Can't simply regulate prices without driving firm out of business.
2. Occurs when fixed costs are extremely large relative to marginal costs.
3. Typical regulatory solution is to force monopolists to price at average cost.
   a. Allow monopolists to just break even.
   b. Still inefficient.
   c. Gives regulated firm an incentive to inflate costs.

Ex: Natural Monopoly

B. Minimum Efficient Scale

1. The level at which a firm must produce to reach its lowest production cost?
2. If there is enough demand in the market to accommodate multiple firms producing at this cost, then an industry can be competitive.
   a. Otherwise only a single firm can survive.
3. Notice that MES is relative to technology
   a. Regulated pricing in an industry could easily reduce incentives to invent new technologies that disrupt the MES.

C. Barriers to Entry

1. Explicit barriers
2. Raising rivals cost
3. Price controls
4. Product standards