

**Exercise Set 2, September 13, 2006**  
(due September 20)

Note: In each of the following exercises, make whatever additional assumptions you need to complete the analysis.

1. In a monopoly market for a single good, each consumer buys one unit or none (in a given period of time). Model the population of consumers as a continuum, with total mass equal to 1. Assume that the distribution of willingness-to-pay for one unit of the good is distributed in the population uniformly on the interval  $[a, b]$ , with  $a$  nonnegative and  $b > a$ . Give formulas for the demand function and the inverse demand function, and sketch a graph of each.
2. Suppose that the monopolist's cost of producing a total quantity  $q$  is  $cq$ , per unit time, with  $c > 0$ . Derive formulas for the monopolist's optimal price and quantity.
3. Define the social surplus in this situation, for a given price and quantity, and derive formulas for the price and quantity that maximize the social surplus. Compare these with the monopoly price and quantity.
4. Derive formulas for the consumer surplus, producer surplus, and dead-weight-loss in the monopoly outcome.
5. Let  $a = m - h$  and  $b = m + h$ . What are the mean and variance of the uniform distribution, in terms of the parameters  $a$  and  $h$ ? Describe what happens to the monopoly price and quantity, and to the various surplus magnitudes, as the variance tends to zero with the mean held constant?