

**Stochastic Math Models (550.252)**  
**Homework 8 (Due Thursday, November 10, 2011)**

**General Directions:** You must show all work and document any assumptions to receive full credit. When formulating models, make sure to define your variables and label your objective function and constraints. All work should be done by hand unless otherwise stated.

1. Lawrence & Pasternack 6.8
2. Lawrence & Pasternack 6.12
3. Lawrence & Pasternack 6.47

Consider the Bill Galen Development Company problem discussed in Section 6.6 of the text. Suppose the utility function for the company corresponding to a return of  $x$  dollars is

$$1 - \left( \frac{x - 120,000}{195,000} \right)^2$$

- (a) Given this utility function, would you characterize the company as risk averse, risk loving, or risk neutral?
  - (b) Determine the optimal strategy for the company using the expected utility criterion.
4. INC manufactures and retails a certain product. The company wants to determine the selling price that maximizes its profit from this product. The unit cost of producing and marketing the product is  $c$ . Demand,  $D$  depends on the selling price,  $p$ ; as  $p$  increases,  $D$  decreases. The Operations Research Department at INC is considering two possible models of demand as a function of price

- *linear demand*:  $D = a - bp$
- *nonlinear demand*:  $D = ap^{-b}$

where  $a$  and  $b$  are positive constants.

- (a) Find the optimal selling price assuming a linear demand function.
- (b) Find the optimal selling price assuming a nonlinear demand function. What restrictions should be placed on the values of  $a$  and  $b$  in this case?
- (c) Economists define *elasticity* as the percentage change in demand caused by a 1% increase in price. We can compute elasticity as

$$\varepsilon = \frac{dD}{dp} \div \frac{D}{p}$$

Use calculus to verify that the linear demand function does NOT exhibit constant elasticity but the given nonlinear demand function does.