1. **Risk**

   (a) Consider two lotteries $\tilde{x}$ and $\tilde{y}$, where $\tilde{x} \sim U(-4, 4)$, and $\tilde{y} \sim U(-2, 3)$ ($U(a, b)$ means a uniform distribution between a and b).

      i. Is $\tilde{y}$ preferred to $\tilde{x}$ by any individual with an increasing utility function? Explain your answer.

      ii. Is $\tilde{y}$ riskier than $\tilde{x}$? Explain your answer.

2. **Incentives**

   1. A monopolist (The principal) can produce a high quality good and/or a low quality good. The marginal cost of production is zero for both qualities. The utility of a type θ consumer (the agent) is given by

$$\theta q - p,$$

   where q is the quality of the good that he consumes and t is the price that he pays to the monopolist. Each consumer can consume only ONE UNIT either high quality OR low quality. There is a mass one of consumers: 3/4 of them have $\theta = \underline{\theta} = 1$ and 1/4 of them have $\theta = \overline{\theta} = 3$. The monopolist knows the distribution of consumer types. The quality is such that for high quality, $q = \overline{q} = 4$ and for low quality, $q = \underline{q} = 1$. Assume that the reservation utility is zero for both types of consumers.

   1.1. Suppose that the monopolist (i.e. the principal) sells only the high quality good. What is the profit-maximizing price? What is the profit?

   1.2. Suppose that the monopolist sells both the high quality good and the low quality good through a menu $\left\{(\overline{q}, \overline{p}), (\underline{q}, \underline{p})\right\}$. Write the participation and incentive compatibility constraints as well as the firm's objective function. Compute the optimal menu of contracts and the profit.

   1.3. From 1.1 and 1.2, obtain an answer to the question of whether the monopolist will sell only the high quality good or both the high quality and the low quality goods.