

## Problem 1

A grocery store sells vegan cookies. Vegans have high valuation for vegan cookies, but non-vegans low valuation for vegan cookies. Specifically, the grocery store can sell a bag with 20 cookies and/or a bag with 10 cookies. One bag per customer. Non-vegans don't want 20 cookies, but vegans are interested in both the 10- and 20-cookie bag.

Let  $P_X$  denote the price of a bag of  $X$  cookies. (For example,  $P_{10}$  is the price of a 10-cookie bag.) A vegan has a cookie utility function of

$$U_H(X) = 8X - P_X, \quad X \in \{10, 20\},$$

and a non-vegan has a cookie utility function of

$$U_L(X) = 6X - P_X, \quad X \in \{10\}.$$

The proportion of vegans is  $\alpha$  and the marginal cost of a vegan cookie is 4. Finally, suppose the store can prevent resale. (Perhaps they force you to eat them all right then and there because they are super-exclusive cookies and they don't want their secrets leaked.)

- (a) Explain why the grocery store cannot engage in third-degree price discrimination.
- (b) Express profit as a function of  $\alpha$  if the grocery store sells only 20-cookie bags.
- (c) Express profit as a function of  $\alpha$  if the grocery store decides to sell 10-cookie bags to non-vegans and 20-cookie bags to vegans.
- (d) Determine for which values of  $\alpha$  the grocery store should target only vegans, and for which the grocery store should target both types of buyers.

## Problem 2

State whether the following claims are true or false and explain why.

- (a) A firm selling a good to consumers in two cities should set a higher markup in the city in which demand for the product is elastic.
- (b) Two firms are geographically differentiated (e.g., gas stations on opposite sides of Davis). If travel costs decline, we should expect the cross-price elasticities of the two products to become more positive.
- (c) A monopoly that can engage in first-degree price discrimination sells more units of a good than a monopoly that cannot price discriminate.
- (d) Relative to a monopoly that can't price discriminate, first-degree price discrimination lowers welfare.
- (e) Relative to the case in which a firm must charge the same price to everyone, third-degree price discrimination makes the firm better off, but all consumers worse off.
- (f) The Nash equilibrium of a prisoner's dilemma has the highest combined payoffs.