Problem 1. A firm distributes natural gas to a town with 100 households. The firm has fixed costs of FC $= 10,000$, marginal cost of MC $= 10$, and the inverse demand curve for each household is $P = 30 - Q$.

(a) Explain why we know this firm is a natural monopoly.

(b) Explain why if the regulator sets a linear price of $P = 20$, then the firm's economic profits will be equal to zero. Also find consumer surplus.

(c) You convince the regulator to use fixed-price (a.k.a price cap) regulation: the price will stay at $P = 20$ even if the firm finds ways to lower its costs. The firm can lower its marginal cost by exerting effort according to $\text{MC}(e) = 10 - e$, but exerting effort costs $C(e) = 100e^2$ because a bonus is paid to employees who work harder.

Will the firm invest to lower its marginal cost? If so, how much profit will the firm earn under fixed-price regulation?

(d) Suppose the regulator can identify two different types of households: one type with low elasticity and the other with high elasticity. In general terms, how would the regulator's pricing decision change relative to part (b)? How would this affect consumer surplus?

(e) What is the optimal two-part tariff that the regulator could set if it wanted to maximize welfare?

(f) How much would consumer and producer surplus change if the regulator set the optimal two-part tariff instead of the linear price of $P = 20$?

Problem 2. State whether the following statements are true or false and explain why.

(a) If unregulated, a monopoly using Mickey Mouse pricing generates higher profits and greater deadweight loss than a monopoly that uses linear pricing.

(b) Ramsey prices maximize a firm's profits by setting high prices for inelastic customers and low prices for elastic customers.

(c) Cost-plus regulation provides better incentives for the firm to offer good service than fixed-price regulation.

(d) If an incumbent sets prices below an entrant's marginal cost, then the incumbent is guilty of predatory pricing.

(e) If an incumbent with a dominant market position bundles goods and drives an entrant out of the market, then bundling is anti-competitive.