ECONOMICS 331
Mathematical Economics
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Homework Assignment 4

$$Q_d = kP^{-\epsilon}(\epsilon > 0) \qquad Q_s = c(P - T_0)$$

are the demand and supply curves for a commodity whose price is P. T_0 is a sales tax imposed by the government on sales of this commodity.
(a) Compute the price elasticity of demand and the price elasticity of supply of this commodity.
(b) Find an expression for $\partial P/\partial T_0$ where P is the equilibrium price in this market.
(c) Show that

$$0 < \partial P/\partial T_0 < 1.$$

(d) Total tax revenue collected by the government is $R = T_0$Q. Find an expression for $\partial R/\partial T_0$.

[2] Consider the operator of a small newsprint production plant. He has fixed costs of \$1600 per day for property taxes, interest on debt, etc., and has additional costs that vary with the amount Q of newsprint he produces. His total costs per day are given by

$$C = 1600 + 40Q + \frac{2}{3}Q^{3/2}$$

He sells his output to local newspaper publishers and the price he obtains depends on how much he tries to sell. Let the demand curve he faces be

$$P = 100 + 512Q^{-1/2}$$

(a) What are his average and marginal costs of production expressed as functions of Q?
(b) What are his total and marginal revenues expressed as functions of Q?
(c) How much output per day should he produce if he expands production just to the point where marginal revenue equals marginal cost? What profit if any will he make in \$/day? (hint: substitute $X = Q^{1/2}$ into the equation you have to solve, determine X, then Q)