1.

(a) $P(Q) = 40 - Q$

$TR = P(Q) \cdot Q = 40Q - Q^2$

$MR = \dfrac{dTR}{dQ} = 40 - 2Q$

$TC = 100 + Q^2$

$MC = \dfrac{dTC}{dQ} = 2Q$
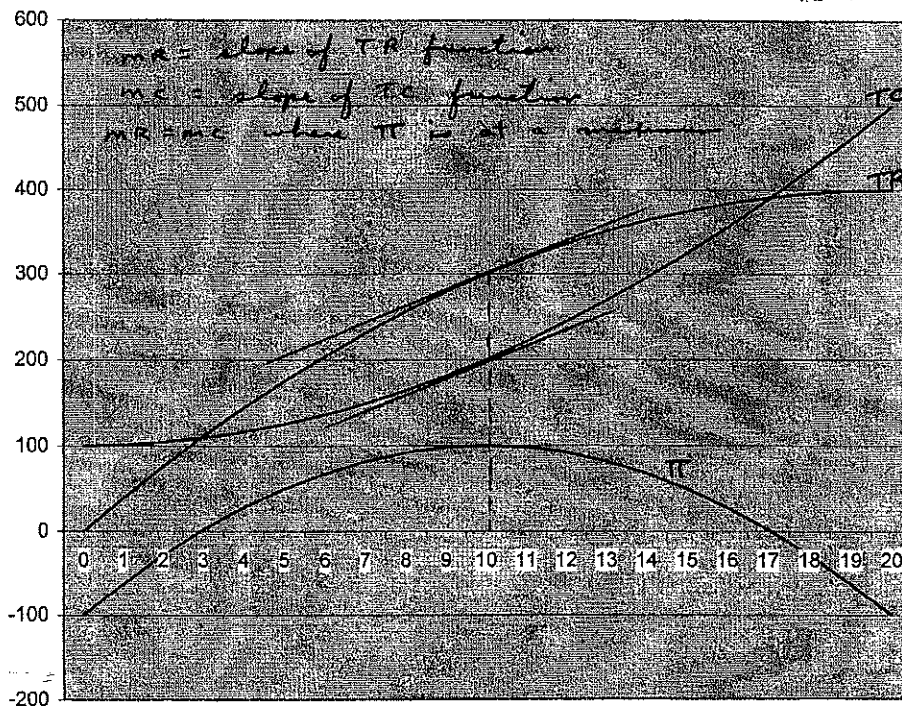
$MR = MC$ for max π: $40 - 2Q = 2Q$, ∽ $40 = 4Q$

$Q^* = 10$, $P^* = 40 - Q = \$30$

$\pi = TR - TC = (40Q - Q^2) - (100 + Q^2) = \$100$

Total Revenue, Total Cost, and Profit

(b)

2.

Inverse elasticity rule: $\frac{P-mc}{P} = -\frac{1}{\varepsilon}$
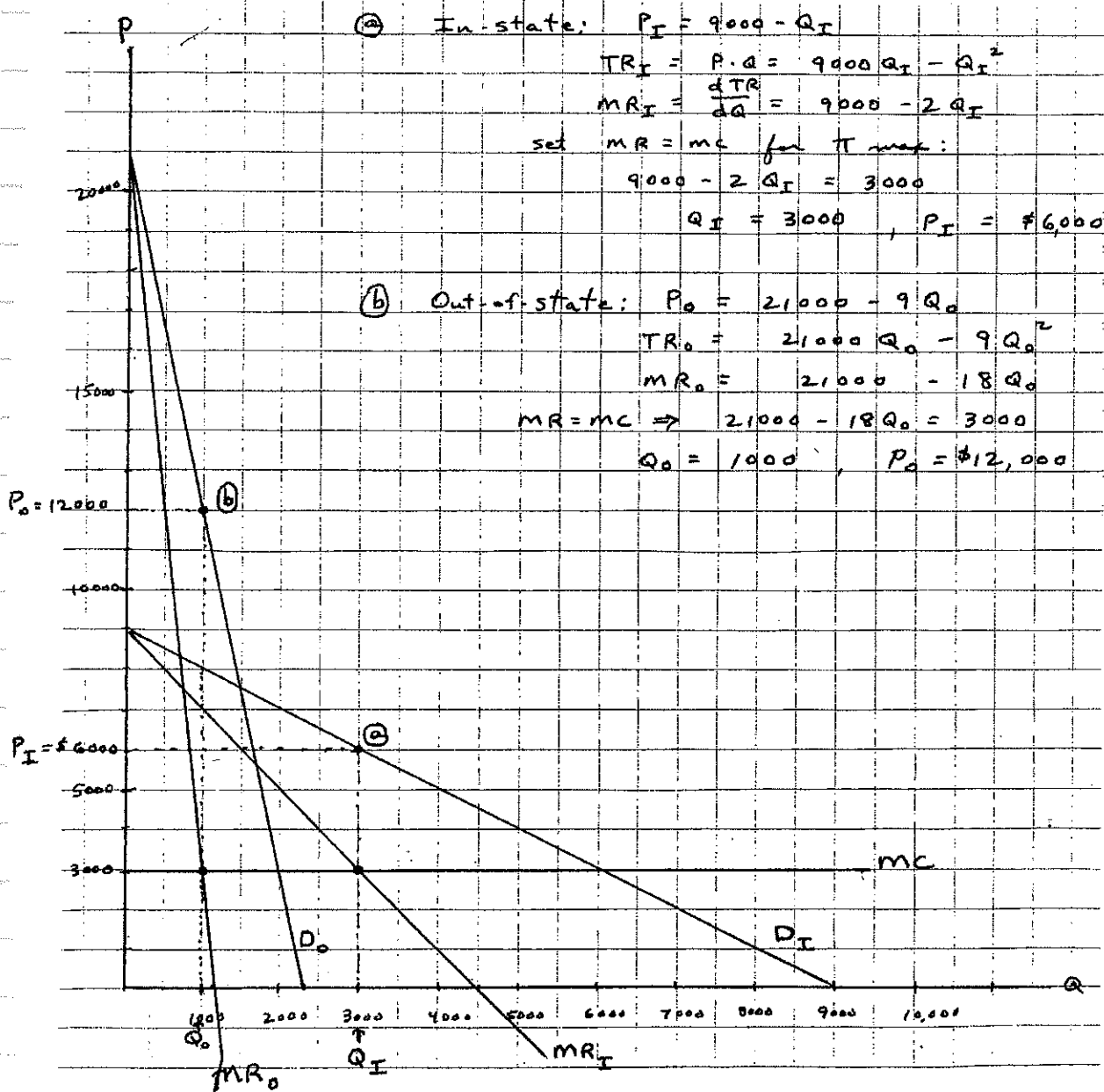
if $\varepsilon = -2$ and $mc = \$2$:

$\frac{P-2}{P} = \frac{1}{2}$, $P = \$4$

so set the shelf price of a box of cereal equal to $\$4$ per box in the grocery store.

if $\varepsilon = -5$, $\frac{P-2}{P} = \frac{1}{5}$, $P = \$2.50$

so offer a coupon in the newspaper with a redemption value of $\$1.50$, so that coupon users pay an effective price of $\$2.50$.

3.

(a) In-state: $P_I = 9000 - Q_I$

$TR_I = P \cdot Q = 9000 Q_I - Q_I^2$

$MR_I = \frac{dTR}{dQ} = 9000 - 2 Q_I$

set $MR = mc$ for π max:

$9000 - 2 Q_I = 3000$

$Q_I = 3000$, $P_I = \$6,000$

(b) Out-of-state: $P_0 = 21,000 - 9 Q_0$

$TR_0 = 21,000 Q_0 - 9 Q_0^2$

$MR_0 = 21,000 - 18 Q_0$

$MR = mc \Rightarrow 21,000 - 18 Q_0 = 3000$

$Q_0 = 1000$, $P_0 = \$12,000$

4. Monopoly results in a misallocation of resources and hence is undesirable from society's point of view. In maximizing profits, a monopolist restricts output and drives up price. At the output a profit-maximizing monopolist selects, the price consumers are willing to pay for an additional unit of the good exceeds the marginal cost of supplying another unit of the good. Hence there is a deadweight loss to society—a loss to consumers that is not offset by a gain to the monopolist. The deadweight loss due to monopoly can be seen in the following simple diagram.

The Deadweight Loss of Monopoly

The competitive long-run supply curve is *LS*; if the industry is competitively organized, output is *Q* and price is *P*. With monopoly, *LS* is assumed to be the same as the monopolist's long-run *AC* and *MC* curves, and the profit-maximizing output is Q_M at a price of P_M. Price is higher and output lower under monopoly. The shaded rectangular area shows monopoly profit. Triangular area *BCA* is the deadweight loss associated with the reduced output under monopoly.