Problem Set #6 – Answer Key

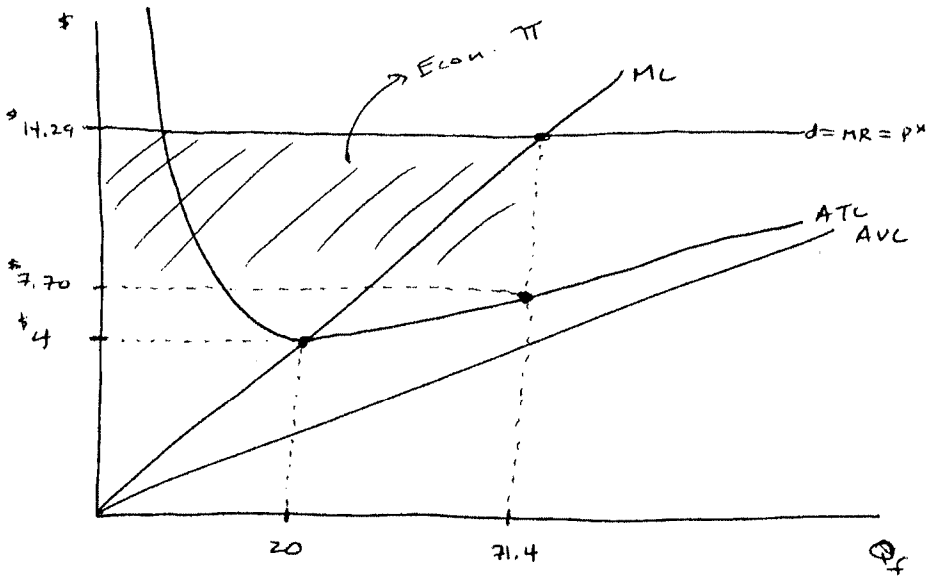
1 $C_{SR} = w \cdot \frac{Q^2}{K} + r \cdot K$

$C_{SR} = \frac{Q^2}{10} + 40$

$MC = \frac{Q}{5}$

$AVC = \frac{Q}{10}$

$ATC = \frac{Q}{10} + \frac{40}{Q}$



$ATC = MC \Rightarrow \frac{Q}{10} + \frac{40}{Q} = \frac{Q}{5}$

$Q^2 + 400 = 2Q^2$

$Q^2 = 400 \quad Q = 20 \rightarrow MC = 4 = ATC$

$MC = \frac{Q}{5} \rightarrow P = \frac{Q}{5}$ $\boxed{Q = 5P}$ → ACME's Supply.

[2] $Q_M = q_1 + q_2 + \dots Q_{10}$ (→ MKt. Supply; → firm supply)

$Q_M = 5P + 5P + \dots + 5P$

$\boxed{Q_M = 50P}$

[3] $1000 - 20P = 50P$

$1000 = 70P$

$\boxed{P = \$14.29}$ $\boxed{Q_M^* = 714.20}$

[4] $TR = (71.4) * (\$14.29) = Q * P$

$TC = (71.4) * (\$7.70) = Q * ATC$

$\pi = \$470.53$

[5] Firms will enter. P_{LR} = Min ATC (SR) or (LR)

because this is the optimal plant size.

If you derive the long run cost function:

$C_{LR} = 2 \cdot w^{1/2} r^{1/2} Q \Rightarrow C_{LR} = 4Q \quad ATC = 4$

Min of SR ATC $\Rightarrow \$4$

$P_{LR} = \$4$ $Q_M = 1000 - 20(4) = 920$

$\frac{Q_M}{Q_f} = \frac{920}{20} = 46 \rightarrow$ 46 firms in the LR.

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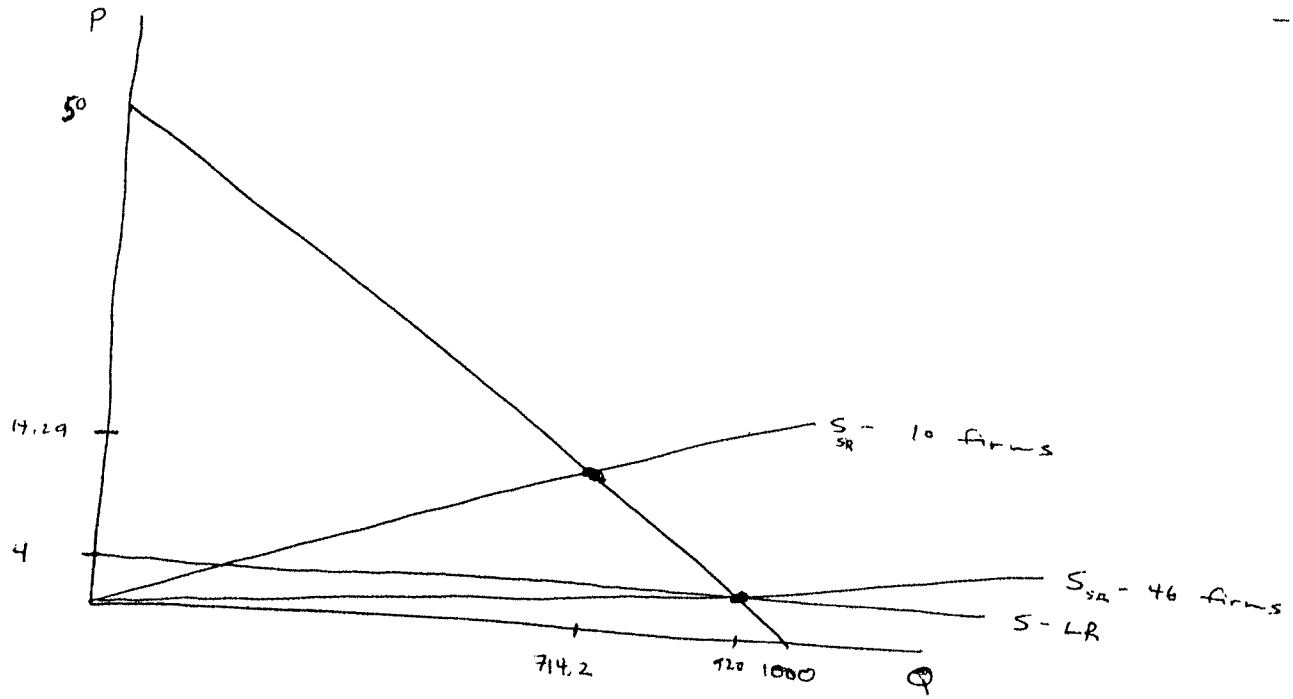

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a) SR → $Q_M^S = 230P$ → Supply for 46 firms.

$P = \frac{1}{230}Q$ → Inverse supply for 46 firms.

$Q_M^d = 800 - 20P$

$D = S$ →

$800 - 20P = 230P$

$800 = 250P$

$P^* = 3,20$

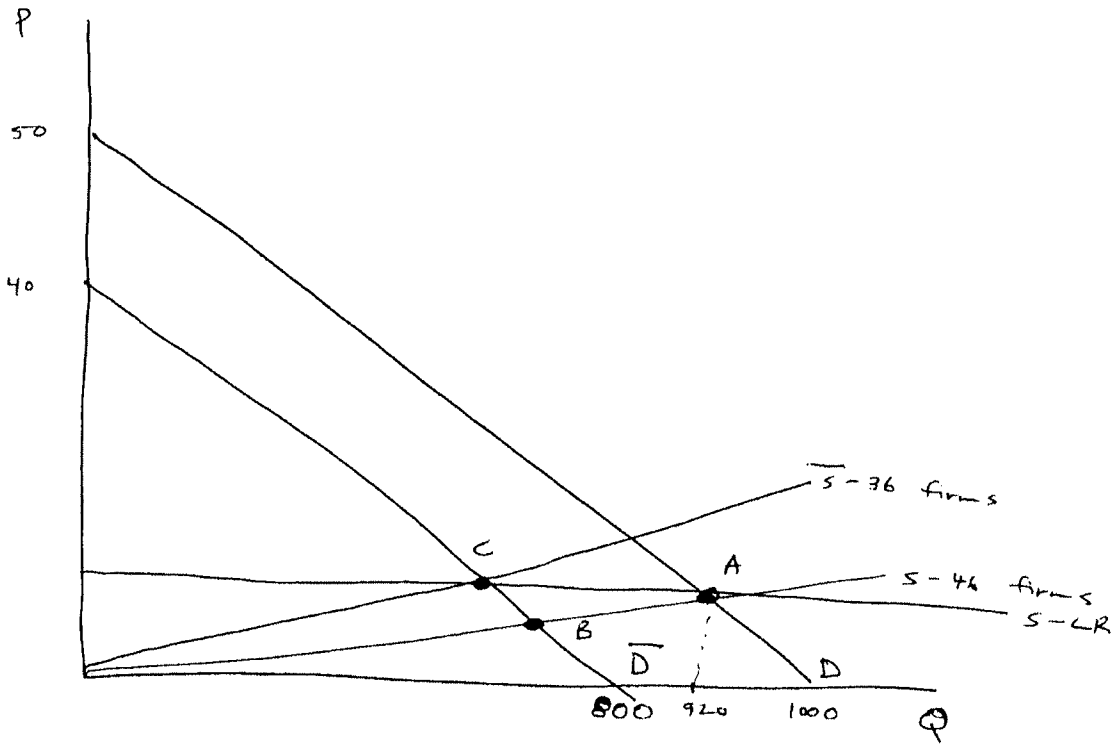
$Q_M^* = 736$

} → Causes firms to lose money.

Firms exit.

LR → $Q_M^d = 800 - 20(4) = 720$

$\frac{720}{20} = 36$ ⇒ 36 firms. →



Short Run → A to B

Long Run → B to C

h)

$Q_M^s = 230P$ → 46 firms

$Q_M^d = 1200 - 20P$

$1200 - 20P = 230P$

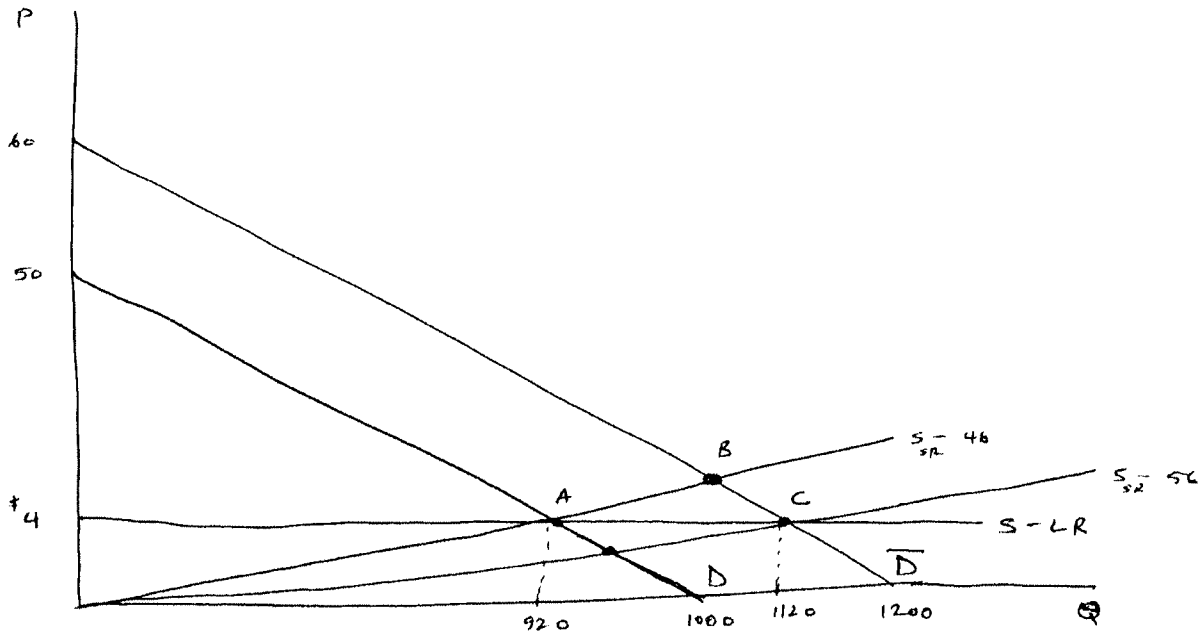
$1200 = 250P$

$P = 4.80$
$Q_M^* = 1104$
$Q_f = 24$

} Positive Econ Profit → Firms Enter

$P_{LR} = 4 \Rightarrow Q_M^d = 1200 - 20(4) = 1120$

$\frac{1120}{20} = 56$ → 56 firms in the long run



A to B ⇒ Short Run

B to C ⇒ Long Run

(c) Optimal Plant Size Changes to $\bar{K} = 20$.

$$C_{SR} = w\frac{Q^2}{20} + r \cdot 20$$

$$C_{SR} = \frac{Q^2}{20} + 80$$

$$MC = \frac{Q}{10}$$

$$ATC = \frac{Q}{20} + \frac{80}{Q}$$

$$MC = ATC \Rightarrow \frac{Q}{10} = \frac{Q}{20} + \frac{80}{Q}$$

$$2Q^2 = Q^2 + 1600$$

$$Q^2 = 1600$$

$$Q = 40 \qquad MC = ATC = \$4$$

P_{LR} ⇒ does <u>not</u> <u>change</u>. However,

$$\frac{Q_M}{Q_f} = \frac{920}{40} = 23 \rightarrow$$ The # of firms in the LR declines to <u>23</u>.