## Multiple choice  Practice MT2

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Practice MT 2 - Short Answer Solutions

1. a) All firms seek to maximize profits (\( \Pi \)).

b) note competition \( \Rightarrow \) free entry & free exit from the industry. If there are profits \( \Rightarrow \) new firms will enter reducing profits to zero. If firms do not behave in profit max way \( \ldots \ldots \) their profits will be less than zero & they cannot survive \( \ldots \ldots \) They will exit industry. So in order to survive \( \ldots \ldots \) comp. firms must behave as profit maximizers.

c) monopolist (publicly traded) will not necessarily behave this way except for the fact that stock holders will demand this strategy! If a firm doesn’t max profit \( \Rightarrow \) stock price will fall & outsiders can buy up the firm’s stock & then operate as profit maximizers. The only way to prevent this is to behave as profit maximizer from the start! (See TA’s) Non publicly traded monopoly could get away with not being a profit maximizer.
1) max \( \Pi \Rightarrow \) select output \((Q)\) such that \( MB = MC \). A firm's \( MB \) is \( MR \Rightarrow \) operate where \( MR = MC \).

Examples: \[
\begin{array}{c|c|c|c}
& MB & MC \\
\hline
Q_0 & & \\
Q^* & & \\
Q_1 & & \\
Q & & \\
\end{array}
\]

At \( Q_0 \): \( MB \) from producing one more unit is greater than \( MC \) of producing one more unit \( \Rightarrow \) expanding output will \( \uparrow \Pi \).

At \( Q_1 \): \( MC \) from producing one more unit is less than \( MB \) from producing one more unit \( \Rightarrow \) reducing output will \( \uparrow \Pi \).

Settle in at \( Q^* \) where \( MB = MC \) for profit max condition. Also think Calculus First order conditions [Ask your TA]
e) competitive firms are price takers. 
sell all they can at some \( P \Rightarrow \)

\( MR = P \) ie) sell one more \& receive \( P \) in additional revenue.

\[ \begin{align*}
P & \quad \text{face a horizontal D curve} \\
Q & \quad \text{Shaded area} \Rightarrow \\
Q + 1 & \quad \text{gain from selling one more unit equals \( P \).}
\end{align*} \]

\[ \text{P = MR: setting } MR = MC \Rightarrow \quad P = MC \quad \boxed{\text{efficient}} \]

\[ \begin{align*}
D & \quad \text{D = MR to society} \\
Q^* & \quad \text{also MR to firm} \\
Q & \quad \text{at } Q^* \text{ MB to society just equals MC of production}
\end{align*} \]

\[ \text{efficient } \Rightarrow \text{ no one willing to pay more than MC for additional units} \]

Key: \( \text{MB of society is same as MB of firm because D curve is MR curve!} \)
To sell more than $Q_0$, firm must ↓ $P$ from $P_0$ to $P_1$, & sell $(Q_1 - Q_0)$ additional units. They must however lower $P$ on all units sold!

Lose: $(P_0 - P_1)Q_0$ in revenue from selling $Q_0$ units at $P_1$, which they used to sell at $P_0$. \[ P_1 < P_0 \]

Gain: $P_1(Q_1 - Q_0)$ in revenue from selling $(Q_1 - Q_0)$ units they didn't used to even sell, at a price of $P_1$. \[ \text{So} \]

additional revenue from selling more must be less than the selling price $(P_1)$ \[ MR < P \text{ } \Rightarrow \text{ } MR \text{ curve will be below D curve!} \]
For each additional unit beyond $Q^m$ up to $Q^*$, the MB (MV) (height of D curve) to society from each unit exceeds the MC of production $\Rightarrow$ society benefits from this extra production, but firm (by max $\Pi$) restricts $Q$ to $Q^m$, which is less than the socially optimal level of output $\Rightarrow$

Shaded area is loss of surplus to society from firm max $\Pi$ ![That is at $Q^m$, people are WEP more than MC for additional units $\Rightarrow$ loss of surplus](

Key: MB of society not same as MB of firm because MR curve lies below D curve
② $STC = 16 + q^2$

a) $FC$: not a function of $q$ ...

$$SVC(q) = q^2$$  

$$FC = 16$$

b) To get average costs ... divide through by $q$ ...

$$AFC(q) = \frac{FC}{q} = \frac{16}{q}$$

$$SAVC(q) = \frac{SVC(q)}{q} = \frac{q^2}{q} = q$$

c) See next page ... ...

d) Using calculus: $SMC(q) = \frac{dSTC}{dq} = \frac{d}{dq} (16 + q^2) = 2q$

$$SMC(q) = 2q$$

or

$$SMC = STC(q+1) - STC(q) = 16 + (q+1)^2 - 16 - q^2$$

$$SMC = 16 + q^2 + 2q + 1 - 16 - q^2$$

$$SMC(q) = 2q + 1$$

Note different answers as explained in class, [Ask TAS]
c) $SATC = \frac{STC}{q} = \frac{16 + q^2}{q} = \frac{16}{q} + q$

at $q=0$ undefined so never intersects vert. axis
[blows up & approaches $\infty$]
so $SATC > SMC$ at small $q$ \Rightarrow $SATC$ is $\downarrow$ while $SMC$ is $\uparrow$.

2) They will intersect at $SATC$ minimum value
at which point (after) $SMC > SATC$ \Rightarrow $SATC$ will be $\uparrow$ \Rightarrow $SATC$ is $U$ shaped!

[Finding the point of intersection] $SATC = SMC$ \Rightarrow
\[
\frac{16}{q} + q = 2q \Rightarrow 16 = q^2 \Rightarrow \sqrt{q = 4}
\]
$SMC = 2q \Rightarrow SMC = 2(4) = 8 = SATC \checkmark$
f) Law of Diminishing Returns here means that as we add labor to fixed input, productivity ↓ ⇒ we should see ↑ MC ie SMC should be upward sloping!

This is the case so yes SMC does obey the law of Diminishing Returns here.

g) Because a firm’s supply decision is based on costs (MC) all we need is we know competitive firms will behave such that \( p = MC \)

set \( p = SMC \) ⇒

equation of supply curve is:

\[
p = 2q
\]