Supplement 6-7 Review

This review is not all inclusive. You are expected to know how to do all the problems in the homework.

Revenue and Cost

1. $TR(q) =$ Total Revenue = total money bought in from a sale of q items = (price per item)*(quantity)
$FC = TC(0) =$ Fixed Costs = money you must spend even if you produce 0 items
$VC(q) =$ Variable Costs = money you spend to produce q items, excluding fixed costs.
$TC(q) = FC + VC(q) =$ Total Costs.
$P(q) = TR(q) - TC(q) =$ Profit = vertical gap between TR and TC.

2. **MAX PROFIT METHOD 1:** The maximum profit occurs at the quantity where the TR graph has the biggest gap above the TC graph.

3. $MR(q) = TR(q+1) - TR(q) =$ Marginal Revenue = money in from selling an additional item. So for example $MR(3) = 10$ means that when you sell the 4th item (meaning when you go from selling 3 to 4), it will bring in \$10 more dollars of revenue.
Note also that $MR(q) = \frac{TR(q+1)-TR(q)}{(q+1)-q} =$ slope of the secant line on TR from q to $q+1$.
Similarly,
$MC(q) = TC(q+1) - TC(q) =$ Marginal Cost = cost of producing an additional item
So for example $MC(12) = 2$ means that when you produce the 13th item (meaning when you go from producing 12 to 13), it will add an additional \$2 dollars to your total cost.
And, again, note $MC(q) = \frac{TC(q+1)-TC(q)}{(q+1)-q} =$ slope of the secant line on TC from q to $q+1$.
$MP(q) = MR(q) - MC(q) =$ Marginal Profit = the change in profit if you produce and sell one more item.

4. Important observations:
If $MR > MC$ at q, then profit increases from q to $q+1$. (This also means $MP(q)$ is positive)
If $MR < MC$ at q, then profit decreases from q to $q+1$. (This also means $MP(q)$ is negative)

5. **MAX PROFIT METHOD 2:** The maximum profit occurs at a quantity when $MR(q) = MC(q)$ (more specifically, at the quantity when it switch from $MR > MC$ to $MR < MC$).

6. Note that a secant line drawn from q to $q+1$ will often look like a tangent line that just touches the graph. Typically it is best in these situation to just try to draw the line as if it is a tangent line (student tend to overcompensate when they try to connect q and $q+1$). So graphically, we usually just visualize the draw the MR and MC lines as tangents.

7. **MAX PROFIT METHOD 2':** Since $MR(q)$ is the slope of $TR(q)$ and $MC(q)$ is the slope of $TC(q)$, we can find when $MR(q) = MC(q)$ by finding when they have the same slopes. If $TR(q)$ or $TC(q)$ are straight line graphs, then we can just slide our ruler parallel until we find a point on the other graph that has the same point. The maximum profit will occur at a quantity where this happens.

8. $AR(q) = \frac{TR(q)}{q} =$ Average Revenue = average price per item = slope of the diagonal line to TR.
$AC(q) = \frac{TC(q)}{q} =$ Average Cost = average cost per item = slope of the diagonal line to TC.
$AVC(q) = \frac{VC(q)}{q} =$ Average Variable Cost = average cost per item, excluding fixed cost = slope of the diagonal line to VC.

9. Ruler Tricks we already know:

   (a) To compute MR or MC, you can use the "secant line method". That is, draw the secant line, find two points and compute the slope. Often this line will look like a tangent line.

   (b) To compute AR, AC, or AVC, you can use the "diagonal line method". Draw the diagonal line through the original and the given point and find the slope.

   (c) To find a location with a particular MR or MC value, use the "reference line and slide ruler method". That is, draw the reference line and slide your ruler parallel until you find a point on the graph that has the same slope.

   (d) To find a location with a particular AR, AC or AVC value, use the "reference line and intersecting method". That is, draw the reference line and see where it intersects the graph.

   (e) To find lowest or highest values of AR, AC, or AVC, you can use "rotating ruler method". That is, fix the ruler at the origin and rotate.

   (f) To find lowest or highest MR or MC, just look for when the graph is least steep or most steep. That is, checking increments consecutively put your ruler on the secant line and compare slopes.

   (g) If two points are very close together it is often difficult to be precise when finding the change in height. So it may be better to use the secant line method to compute the slope first. Then use the slope to find the change in height.