Deriving Marginal Revenue

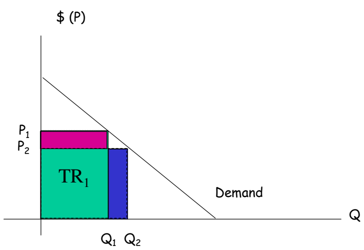
$MR = \Delta TR/\Delta Q$

$TR = PQ$

(-) (+)

$\Delta TR = (P_2 - P_1)Q_1 + (Q_2 - Q_1)P_2$

$= \Delta P * Q_1 + \Delta Q * P_2$



Deriving Marginal Revenue, Continued

$\Delta TR = \Delta P * Q_1 + \Delta Q * P_2$

The slope of the inverse demand curve, $\Delta P/\Delta Q = -B$,
so $\Delta P = -B\Delta Q$

Therefore, $\Delta TR = \Delta P\, Q_1 + \Delta Q P_2 = -B\Delta Q\, Q_1 + \Delta Q\,(A - BQ_2)$

Since we want MR, we must divide $\Delta TR/\Delta Q$:

$\Delta TR/\Delta Q = [-B\Delta Q\, Q_1 + \Delta Q\,(A - BQ_2)]/\, \Delta Q = -BQ_1 + A - BQ_2$

If Q_1 and Q_2 are very close (which is what we want) then:

$MR = \Delta TR/\Delta Q = A - 2BQ$

The Easy Way to Deriving Marginal Revenue:

Take the Derivative of Total Revenue

$$TR = PQ = (A-BQ)Q = AQ - BQ^2$$

How do we take the derivative of this?

3 Basic Rules to Remember

Derivative of a constant = 0 (constant doesn't change as Q changes)

Derivative of bQ term = b
(like the slope of a line -- a Q increases, total increases by b)

Derivative of "power" term, e.g, $cQ^X = c(XQ^{X-1})$
(if you want to know why, take a calc class)

$$\partial TR/\partial Q = MR = A - 2BQ$$

How about Marginal Cost?

Take the Derivative of Total Cost

$$TC = VQ^2 + WQ + Z$$

$$\partial TC/\partial Q = MC = 2VQ + W$$

To find the profit-maximizing quantity:
Set MR = MC and solve for the optimal Q*.

$$A - 2BQ = 2VQ + W$$

$$Q^* = (A - W)/2(V+B)$$

Last Thing to Remember

With 2 variables, you can only differentiate with respect to one.
Treat the other variable as a constant.

$$C(Q_1+Q_2) = a + bQ_1 + cQ_2 + dQ_1Q_2$$

$$\partial C/\partial Q_1 = MC_1 = b + dQ_2$$

$$\partial C/\partial Q_2 = MC_2 = c + dQ_1$$