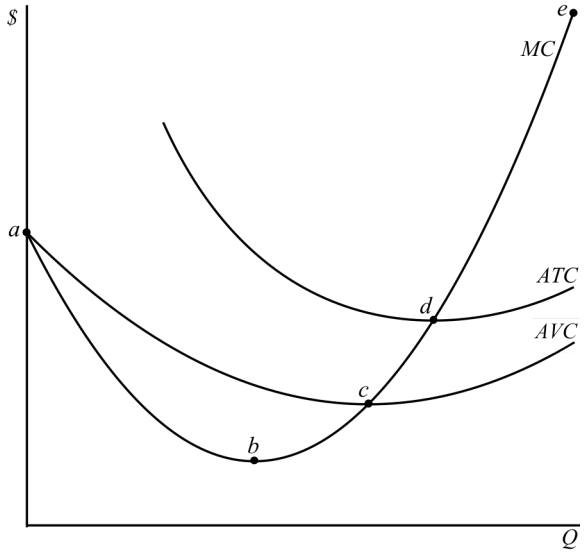
The Relationship between the *MC* curve and the Average curves



In the diagram at right, we have increasing returns from *a* to *b* and diminishing returns from *b* to *e*.

① The *MC* curve and the *AVC* curve begin at the same place on the vertical axis (point *a*). To see that this must always be true, go from $Q = 0$ to $Q = 1$ in the AVC_+ equation on the previous page, giving:

$$AVC_+ = \left(\frac{0 + MC}{0 + 1}\right) = MC$$

because $TVC = 0$ when $Q = 0$.

② When the *MC* curve is below both the *AVC* and *ATC* curves, then both *AVC* and *ATC* are declining. This occurs between *a* and *c*. Note that it is irrelevant that *MC* is rising between *b* and *c*, all that matters for *AVC* and *ATC* is that *MC* is below them. Diminishing returns are not strong enough between *b* and *c* to pull *AVC* up.

③ When the *MC* curve is below *ATC* but above *AVC*, *AVC* will be rising but *ATC* will still be declining. This occurs between *c* and *d*. Even though *AVC* is rising, diminishing returns are not strong enough between *c* and *d* to offset the falling *AFC* and pull *ATC* up.

④ When the *MC* curve is above both the *AVC* and *ATC* curves, then both *AVC* and *ATC* are rising. This occurs between *d* and *e*.

⑤ The *MC* curve crosses the *AVC* and *ATC* curves at each of their low points.

Note that we have ignored negative returns (which would occur somewhere past *e*)–firms will never go into negative returns, except by mistake. If you hire an extra worker, paying them *w*, and output declines, it makes no sense to hire them–you will immediately lay them off and pay less to get more output! Therefore, our *AVC* and *ATC* curves will stop abruptly at the maximum output for the firm in the short run.

Why economists use marginal cost

① *MC* shows why and how firms make certain decisions, even though they usually do not calculate *MC* directly. For example, if the firm in the diagram on the next page is considering some action (e.g. a price change, extra advertising) that will increase its' output from 30 to 31 then it will consider what will happen to its *TC*. From the *MC* curve we know immediately that *TC* will increase by \$11 ($MC = \$11$ at $Q = 30$).

② *MC* speeds up certain computations. Suppose I want to know *TC* at $Q = 30$ and $Q = 31$ in the diagram. It is obvious that $ATC = 44$ at $Q = 30$ so $TC = \$1320$. Since $MC = \$11$ then $TC = \$1331$ at $Q = 31$ (recall: *MC* is what is added to *TC* for one more unit of *Q*).

③ *MC* increases the accuracy of certain computations. Suppose I want to know *ATC* at $Q = 31$ in the diagram. Since $TC = \$1331$ at $Q = 31$ then $ATC = (\$1331/31) = \$42.94$. If we tried to use the *ATC* curve to read *ATC* it would be impossible to be this accurate. Note: *ATC* (\$42.94) is what each unit costs to make, *MC* (\$11) is what is added to *TC*.

Cost Curve Exercise

For the following information, assume that $TFC = \$720$ and $W = \$15$. Fill in all empty cells in the table and then use the cost curve diagram to check your answers (plot points).

Labor	Output	*MP*
35	24	
40	30	
44	36	
50	48	
56	60	
84	90	
160	120	

TFC	*TVC*	*TC*

AVC	*ATC*	*MC*

Using *TC* and *ATC* at $Q = 60$ above and the *MC* curve below, find very accurate values for *TC* and *ATC* at $Q = 61$. Next, use the *ATC* curve below to find as accurate a value as you can for *TC* at $Q = 70$, then use the *MC* curve to find very accurate values for *TC* and *ATC* at $Q = 71$.