A Firm's Total Cost Graph

Here is the total cost graph of a typical firm operating in the short run. Assume the firm has labor as its variable resource and capital (factory, tools) as its fixed resource. Although this looks like a simple graph, there actually is quite a bit of information contained in it.

1. The total variable cost (TVC) curve shows the total cost of labor to the firm. The TVC curve begins at the origin because if the firm has no output, that means it has no labor and thus has no labor costs.
2. The TVC curve has positive slope throughout the graph because in order to produce more output it must hire more labor. This means its total labor cost (which is really what TVC represents) will increase as its level of output increases.
3. The firm's total cost (TC) is the sum of its TVC and its total fixed cost (TFC).
4. TFC shows how much the firm's capital is costing the firm. TFC is constant at all output levels because the firm's capital stock is fixed in the short run.
5. TFC is the vertical distance between the TC and TVC curves at any given level of output. Since TFC is constant, this vertical gap is the same at all output levels. If the firm produces no output, TFC is the vertical gap 0A. If output is 700 units, TFC is the gap WX. If output is 1100 units, TFC is the gap YZ.
6. The TC curve has positive slope throughout the graph because in order to produce more output it must hire more labor which means TVC will increase (See #2.). Since TFC does not change when output is increased, the increase in TC is equal to the increase in TVC as more output is produced.
7. The slope of the TC curve is $\Delta TC/\Delta Q$ which is the same thing as marginal cost (MC). $MC = \Delta TC/\Delta Q$.
8. The slope of the TVC curve is $\Delta TVC/\Delta Q$ which also is equal to MC because the only change in TC resulting from an increase in output is the change in TVC (See #6.). $MC = \Delta TC/\Delta Q = \Delta TVC/\Delta Q$.
9. The TC and TVC curves are vertically parallel at all output levels because they have the same slope.
10. How is MC related to the TC and TVC curves?
    (a) From 0 to 700 units, the slope of the TC and TVC curves decreases as output increases. Thus, the MC curve is downward-sloping over this output range. (TC is increasing at a decreasing rate.)
    (b) At 700 units of output, the slope of the TC and TVC curves is minimized. At point X the rate of increase in TC has its smallest value. At point W the rate of increase in TVC has its smallest value. This means MC is minimized at 700 units of output.
    (c) As output increases beyond 700 units, the slope of the TC and TVC curves increases. Thus, the MC curve is upward-sloping over this output range. (TC is increasing at an increasing rate.)