

## Homework #5

**Note: Make sure to do these without a calculator. (You can't use one on the exam.)**

- 1.) Let  $TC = 300 + 100Q - 12Q^2 + Q^3$ .
- Identify the fixed and variable costs in the above equation.
  - From the above equation, solve for AFC, AVC, ATC and MC-- in general and then, for  $Q = 10$ . (For MC, remember the following derivatives:  $d(c)/dX = 0$ ,  $d(cX)/dX = c$ ,  $d(cX^2)/dX = 2cX$ , and  $d(cX^3)/dX = 3cX^2$ .)
  - Draw the MC, AVC and ATC curves in general (p. 352's Fig. 9.2 except for AFC). On the graph, note  $Q'$  where  $AVC = MC$  and  $Q''$  where MC is minimized.
  - Calculate  $Q'$  and  $Q''$  for the above equation.
    - Hint for  $Q'$ : what is happening between AVC and MC at  $Q'$  and/or what is the slope of AVC at  $Q'$ ? (Thus, there are two ways to make this calculation.)
    - Hint for  $Q''$ : what is the slope of MC at  $Q''$ ?
  - Calculate AVC and MC for  $Q'$  and  $Q''$  and add it to your graph.
- 2.) If the marginal product of the variable input declines from the very start, what will the short-run marginal cost and average variable and total cost curves look like?

- 3.) Reproduce the table or fill in the blanks for A – Y in this table:

<i>Q</i>	<i>FC</i>	<i>VC</i>	<i>TC</i>	<i>MC</i>	<i>AFC</i>	<i>AVC</i>	<i>ATC</i>
1	\$100	\$50	A	\$50	--	--	--
2	B	C	D	\$30	E	F	G
3	H	I	J	K	L	\$40	M
4	N	O	\$270	P	Q	R	S
5	T	U	V	W	X	Y	\$70