Example 1. The total cost of T-shirts is $C(q) = q^3 - 13q^2 + 51q$ for $0 \leq q \leq 10$.

(a) Estimate using the graph of $C(q)$ where $a(q)$ has a minimum.

(b) Solve for $q$ using Calculus and algebra to minimize $a(q)$. 

\[a(q) = \frac{C(q)}{q} = \frac{q^3 - 13q^2 + 51q}{q} = q^2 - 13q + 51.\] To find the minimum of this, we take the derivative and set it equal to 0:

\[a'(q) = 2q - 13 = 0\]

\[q = \frac{13}{2} = 6.5.\]
Example 2. (Based on Hughes-Hallett, 3e, 4.5#10) The marginal cost at a production level of 2000 units of an item is $10 per unit and the total cost is $30000. If the production level were increased slightly above 2000, would the following quantities increase or decrease, or is it impossible to tell? Why?

(a) Average cost  
(b) Profit