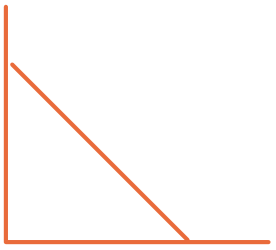
Multiple Choice

1. What is the slope of **an isocost line** for a firm that faces $w = 28$ and $r = 7$, and has the production function $F(L, K) = L + \frac{K}{10}$

   A. -4
   B. 4
   C. 1/4
   D. -1/10



2. What type of return to scales does the function $F(L, K) = L^{0.8} \cdot K^{0.3}$ feature?

   A. Decreasing
   B. Constant
   C. Increasing
   D. Impossible to tell without a cost function

3. Currently, a firm with a cost function $C(Q) = \frac{1}{3}Q^2$ is producing 60 units. If the price they sell their good for is \$30, how would you describe their situation?

   A. They are producing too much
   B. They are profit maximizing
   C. They are not producing enough
   D. Impossible to tell

4. What are the average fixed costs for a firm with the cost function $C(Q) = \frac{1}{2}Q^3 + Q^2 + 3Q + 24$ that produces $Q = 8$?

   A. 13
   B. 46
   C. -3
   D. 3

Short-Answer

5. For the production function $F(L, K) = ln(L) + K$, what are the cost minimizing L^* and K^* for the production of $Q = 375$ when $w = 1$ and $r = 1$? Hint: $ln(1) = 0$

$MRTS = \frac{MP_L}{MP_K} = \frac{1/L}{1} = \frac{1}{L} = 1 = \frac{1}{1} = \frac{w}{r}$ = Price Ratio

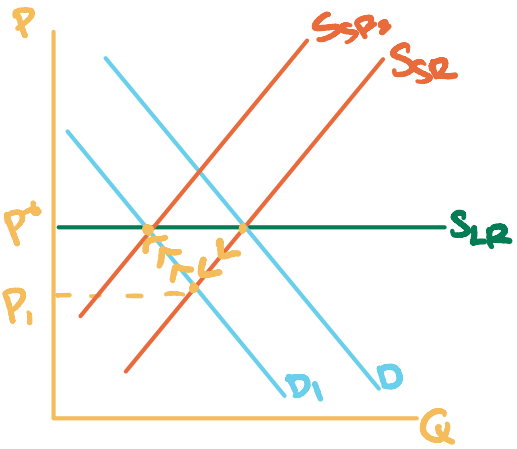
$L^* = 1$

Quantity Const.

$375 = F(L,K) = \ln(L^*) + K$

$375 = \ln(1) + K \Rightarrow 375 = K^*$

6. Imagine that a market that was in long-run equilibrium experiences a decrease in demand. What happens to the number of firms in the industry as it converges to its new long-run equilibrium and why? (2 sentences max.)



$D \to D_1$: $P^* \to P_1$; $P^* > P_1$

: $\pi^* \to \pi_1$ decreased

Some firms expevience neg. π

In the L-R, some firms leave.

The # of firms decreases b/c the decrease in demand led to losses & some firms leave.

Long-Answer

7. Consider a firm with the cost function $C(Q) = \frac{1}{2}Q^2 + 3Q + 18$. This firm operates in a perfectly competitive market.
   (a) What are marginal costs, average costs, average variable costs and average fixed costs of this firm?
   (b) At what price will this firm make exactly zero profits?
   (c) If the price is \$13, how much does the firm produce? What are their revenue, cost and profit?
   (d) In the (Q, P) plane graph this firm's MC, AVC, AFC, and AC. Using a price of \$13, label the firm's quantity choice. Shade in the rectangle on the graph that corresponds to the firm's profits.
   (e) Imagine there are 20 identical firms in this market. What is the short-run market supply curve? What is the market supply when the price is \$13?
   (f) In the long-run, will firms enter or exit the industry? Why?

a. $MC = Q + 3$; $AC = \frac{1}{2}Q + 3 + \frac{18}{Q}$; $AVC = \frac{1}{2}Q + 3$

$AFC = \frac{18}{Q}$

b. $\pi = 0$ when $P = \min(AC)$

$\frac{\partial AC}{\partial Q} = \frac{1}{2} - \frac{18}{Q^2} = 0 \rightarrow \frac{1}{2} = \frac{18}{Q^2} \rightarrow Q^2 = 36 \rightarrow Q^* = 6$

$P^* = MC(Q^*) = MC(6) = 6 + 3 = 9$

$P^* = 9$, $Q^* = 6$

c. $P = MC \rightarrow 13 = Q + 3 \rightarrow Q^* = 10$

$R(Q) = P \cdot Q = 13 \cdot 10 = 130$

$C(Q) = \frac{1}{2}(10)^2 + 3(10) + 18 = 50 + 30 + 18 = 98$

$\pi(Q) = R(Q) - C(Q) = 130 - 98 = 32$

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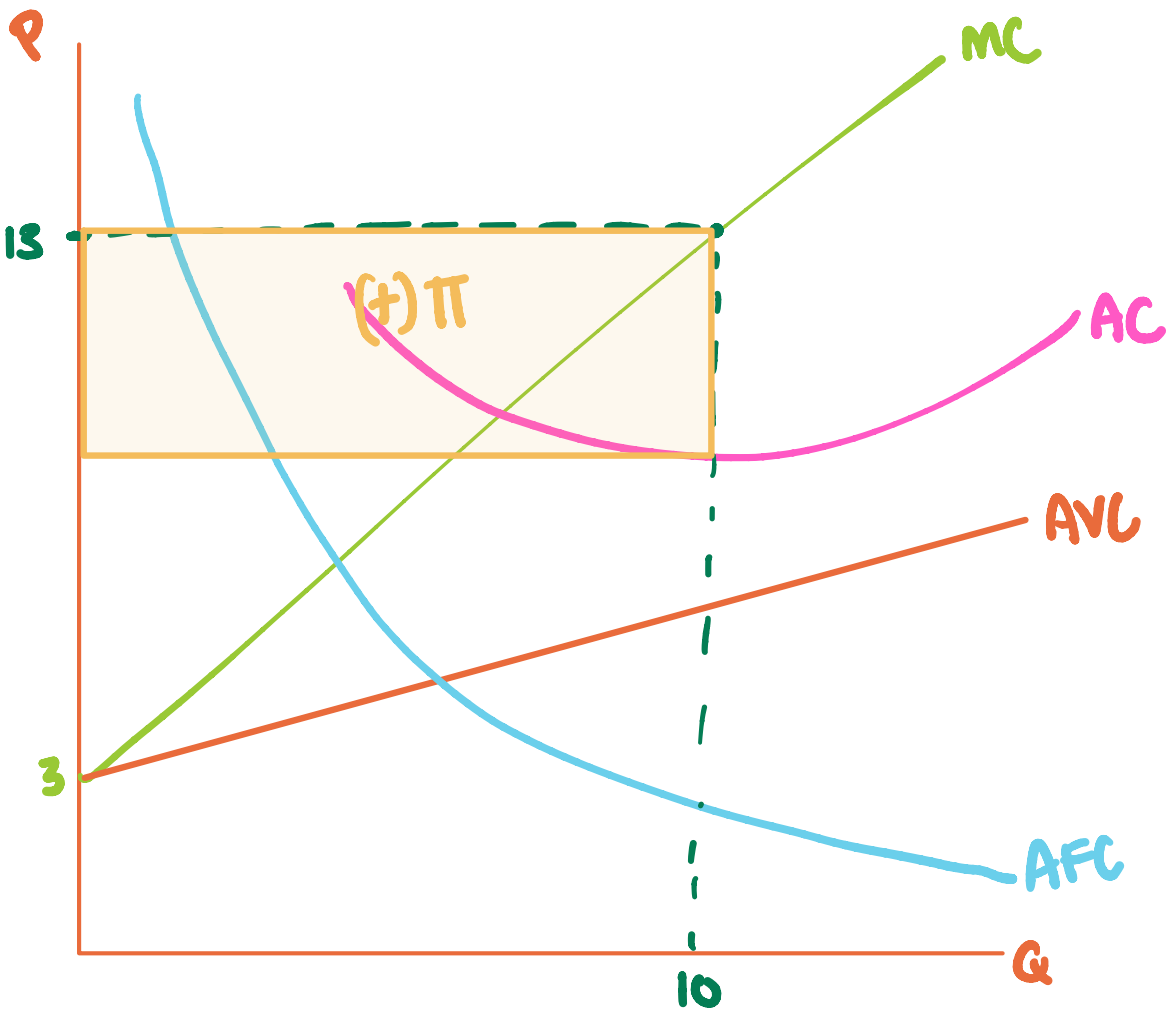

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e. $q^* = P - 3 \longrightarrow P = Q + 3 \longrightarrow P = MC$

market $Q_S = N \cdot Q^*$ ind. firm

$Q^* = 13 - 3 = 10$

$Q_S = 20 \cdot 10 = 200$

$Q_S = N \cdot Q^*$

$200 = N \cdot 10$

$\frac{200}{10} = N = 20$

f. $\pi > 0 \longrightarrow$ Firms enter $\longrightarrow Q_S \uparrow \longrightarrow \downarrow P = \min(AC)$

Firms will enter b/c firms are earning $\pi > 0$ in the short-run.