

### CLAS MIDTERM 3 REVIEW

1.  $F(L, K) = 4L^{1/4}K^{1/4}$

a. Find the short run cost minimizing demands for L

$$Q = 4L^{1/4} \bar{K}^{1/4}$$

$$\left( L^{1/4} = \frac{Q}{4\bar{K}^{1/4}} \right)^4$$

$$L_Q^{\text{SR}} = \frac{Q^4}{256\bar{K}}$$

b. Find the long run cost minimizing demands for L and K

$$\textcircled{1} \quad Q = 4L^{1/4} K^{1/4}$$

$$\textcircled{2} \quad MRTS = \frac{K}{L}$$

$$\textcircled{3} \quad \frac{K}{L} = \frac{\omega}{r}$$

$$\textcircled{4} \quad K = \frac{\omega L}{r}$$

$$\textcircled{5} \quad Q = 4L^{1/4} \left( \frac{\omega L}{r} \right)^{1/4}$$

$$Q = \frac{4L^{1/4} \omega^{1/4} L^{1/4}}{r^{1/4}}$$

$$Q = \frac{4L^{1/2} \omega^{1/4}}{r^{1/4}}$$

$$\left( L^{1/2} = \frac{Q r^{1/4}}{4\omega^{1/4}} \right)^2$$

$$L_Q^{\text{LR}} = \frac{Q^2 r^{1/2}}{16\omega^{1/2}}$$

$$\textcircled{6} \quad K = \frac{\omega L}{r} \rightarrow K = \frac{3L}{r} \quad (\text{L})$$

$$K = \frac{\omega}{r} \left( \frac{Q^2 r^{1/2}}{16\omega^{1/2}} \right)$$

$$K_Q^{\text{LR}} = \frac{Q^2 \omega^{1/2}}{16 r^{1/2}}$$

### CLAS MIDTERM 3 REVIEW

c. Find the short run profit maximizing demand for L

$$\textcircled{1} \quad MP_L = \frac{\bar{K}^{1/4}}{L^{3/4}}$$

$$L^{SR} = \frac{P^{4/3} \bar{K}^{1/3}}{w^{4/3}}$$

$$\textcircled{2} \quad PMP_L = w$$

$$\frac{P\bar{K}^{1/4}}{L^{3/4}} = w$$

$$\textcircled{3} \quad \left( L^{3/4} = \frac{P\bar{K}^{1/4}}{w} \right)^{4/3}$$

d. Find the long run profit maximizing demands for L and K

$$\textcircled{1} \quad MRTS = \frac{K}{L}$$

$$\frac{Pw^{1/4}}{L^{1/2} r^{1/4}} = w$$

$$\textcircled{2} \quad \frac{K}{L} = \frac{w}{r}$$

$$wL^{1/2} = \frac{Pw^{1/4}}{r^{1/4}}$$

$$\textcircled{3} \quad K = \frac{wL}{r}$$

$$\left( L^{1/2} = \frac{P}{r^{1/4} w^{3/4}} \right)^2$$

$$\textcircled{4} \quad PMP_L = w$$

$$\frac{P\bar{K}^{1/4}}{L^{3/4}} = w$$

$$\frac{P}{L^{3/4}} \left( \bar{K}^{1/4} \right) = w$$

$$\frac{P}{L^{3/4}} \left( \frac{wL}{r} \right)^{1/4} = w$$

$$\frac{P}{L^{3/4}} \left( \frac{w^{1/4} L^{1/4}}{r^{1/4}} \right) = w$$

$$\textcircled{5} \quad K = \frac{wL}{r} \rightarrow K = \frac{w}{r} (L)$$

$$K = \frac{w}{r} \left( \frac{P^2}{w^{3/2} r^{1/2}} \right)$$

$$K^{LR} = \frac{P^2}{w^{1/2} r^{3/2}}$$

### CLAS MIDTERM 3 REVIEW

2.  $F(L, K) = L^{1/3}K^{1/3}$

a. Find the short run cost minimizing demands for L

$$Q = L^{1/3} \bar{K}^{1/3}$$

$$\left( L^{1/3} = \frac{Q}{\bar{K}^{1/3}} \right)^3$$

$$\boxed{L_Q^{\text{SR}} = \frac{Q^3}{\bar{K}}}$$

b. Find the long run cost minimizing demands for L and K

$$\textcircled{1} \quad Q = L^{1/3} K^{1/3}$$

$$\textcircled{2} \quad MRTS = \frac{K}{L}$$

$$\textcircled{3} \quad \frac{K}{L} = \frac{\omega}{r}$$

$$\textcircled{4} \quad K = \frac{\omega L}{r}$$

$$\textcircled{5} \quad Q = L^{1/3} \left( \frac{\omega L}{r} \right)^{1/3}$$

$$Q = \frac{L^{1/3} \omega^{1/3} L^{1/3}}{r^{1/3}}$$

$$Q = \frac{L^{2/3} \omega^{1/3}}{r^{1/3}}$$

$$\left( L^{2/3} = \frac{Q r^{1/3}}{\omega^{1/3}} \right)^{3/2}$$

$$\boxed{L_Q^{\text{LR}} = \frac{Q^{3/2} r^{1/2}}{\omega^{1/2}}}$$

$$\textcircled{6} \quad K = \frac{\omega L}{r} \rightarrow K = \frac{\omega}{r}(L)$$

$$K = \frac{\omega}{r} \left( \frac{Q^{3/2} r^{1/2}}{\omega^{1/2}} \right)$$

$$\boxed{K_Q^{\text{LR}} = \frac{Q^{3/2} \omega^{1/2}}{r^{1/2}}}$$

### CLAS MIDTERM 3 REVIEW

c. Find the short run profit maximizing demand for L

$$\textcircled{1} \quad MP_L = \frac{\bar{K}^{\frac{1}{3}}}{3L^{\frac{2}{3}}}$$

$$L^{SR} = \frac{P^{\frac{3}{2}} \bar{K}^{\frac{1}{2}}}{3^{\frac{3}{2}} \omega^{\frac{3}{2}}}$$

$$\textcircled{2} \quad PMP_L = \omega$$

$$\frac{P\bar{K}^{\frac{1}{3}}}{3L^{\frac{2}{3}}} = \omega$$

$$\textcircled{3} \quad 3L^{\frac{2}{3}}\omega = P\bar{K}^{\frac{1}{3}}$$

$$\left( L^{\frac{2}{3}} = \frac{P\bar{K}^{\frac{1}{3}}}{3\omega} \right)^{\frac{3}{2}}$$

d. Find the long run profit maximizing demands for L and K

$$\textcircled{1} \quad MRTS = \frac{K}{L}$$

$$\frac{Pw^{\frac{1}{3}}}{3L^{\frac{1}{3}}r^{\frac{1}{3}}} = \omega$$

$$\textcircled{2} \quad \frac{K}{L} = \frac{\omega}{r}$$

$$Pw^{\frac{1}{3}} = 3L^{\frac{1}{3}}r^{\frac{1}{3}}\omega$$

$$\left( L^{\frac{1}{3}} = \frac{P}{3w^{\frac{1}{3}}r^{\frac{1}{3}}} \right)^3$$

$$\textcircled{4} \quad PMP_L = \omega$$

$$\frac{P\bar{K}^{\frac{1}{3}}}{3L^{\frac{2}{3}}} = \omega$$

$$\frac{P}{3L^{\frac{2}{3}}} \left( K^{\frac{1}{3}} \right) = \omega$$

$$\frac{P}{3L^{\frac{2}{3}}} \left( \frac{\omega L}{r} \right)^{\frac{1}{3}} = \omega$$

$$\frac{P}{3L^{\frac{2}{3}}} \left( \frac{\omega^{\frac{1}{3}} L^{\frac{1}{3}}}{r^{\frac{1}{3}}} \right) = \omega$$

$$\textcircled{5} \quad K = \frac{\omega L}{r} \rightarrow K = \frac{\omega}{r} (L)$$

$$K = \frac{\omega}{r} \left( \frac{P^3}{27w^2r} \right)$$

$$K^L = \frac{P^3}{27w^2r^2}$$

### CLAS MIDTERM 3 REVIEW

3.  $F(L, K) = 4 \min[2L, K]$

- a. Find the long run profit maximizing demands for L and K. Assume that  $p = \$5$ ,  $w = \$20$ , and  $r = \$15$ .

①  $\pi = pF(L, K) - wL - rK$

$$\pi = 4p \min[2L, K] - wL - rK$$

② Set inside of min equal

$$K = 2L$$

③ Put  $\pi$  in terms of  $L$

$$\begin{aligned}\pi &= 4p \min[2L, 2L] - wL - 2rL \\ &= 4p(2L) - wL - 2rL\end{aligned}$$

$$\pi = 8pL - wL - 2rL$$

④  $\frac{\partial \pi}{\partial L} = 0$

$$\frac{\partial \pi}{\partial L} = \underbrace{8p - w - 2r}_{\downarrow} = 0$$

$L$  is not in the derivative,  
so can't isolate for a  
demand function; instead,  
compare derivative to 0  
( $L$  will either be  $\infty$  or 0)

⑤  $\frac{\partial \pi}{\partial L} = 8p - w - 2r = 8(5) - 20 - 2(15) = -10$

$\frac{\partial \pi}{\partial L} < 0 \Rightarrow \text{SHUTDOWN} \Rightarrow \boxed{L^{LR} = 0} \quad \boxed{K^{LR} = 0}$

### CLAS MIDTERM 3 REVIEW

4. Which of the following is false?

- a. A person who is risk neutral would definitely choose a gamble with an expected value of \$100 over a guaranteed payment of \$95

NEUTRAL → choose higher expected value

Gamble has higher  $E[w]$  ⇒ definitely choose gamble  
Statement is true

- b. A person who is risk averse would definitely choose a guaranteed payment of \$100 over a gamble with an expected value of \$95

	Guaranteed	Gamble	
(risk averse)	✓		Definitely choose guaranteed
(higher exp. value)	✓		Statement is true

- c) A person who is a risk lover would definitely choose a gamble with an expected value of \$95 over a guaranteed payment of \$100

	Guaranteed	Gamble	
(higher exp. value)	✓	✓	(risk lover)

- d. A person who is risk averse might choose a gamble with an expected value of \$100 over a guaranteed payment of \$95

	Guaranteed	Gamble	
(risk averse)	✓	✓	(higher exp. value)

- Might choose gamble, might choose guaranteed (cannot determine w/out utility function)
- would not "definitely" choose gamble

Statement is false

- Might choose gamble, might choose guaranteed (cannot determine w/out utility function)

Statement is true

- e. A person who is a risk lover would definitely choose gamble with an expected value of \$100 over a guaranteed payment of \$100

	Guaranteed	Gamble	
(same exp. value)	✓	✓	(risk lover)
(same exp. value)	✓	✓	(same exp. value)

Definitely choose gamble

Statement is true

### CLAS MIDTERM 3 REVIEW

5. The total cost of labor is \$100. The total cost of capital is \$300. Revenue is three times as high as profits. What is the most you can say about profits?

$$\Pi = \underbrace{PQ}_{\text{Revenue}} - \underbrace{WL}_{\text{Total cost of labor}} - \underbrace{rK}_{\text{Total cost of capital}}$$

$$WL = 100$$

$$rK = 300$$

$$PQ = 3\Pi$$

$$\Pi = 3\Pi - 100 - 300$$

$$\Pi = 3\Pi - 400$$

$$-2\Pi = -400$$

$$\boxed{\Pi = \$200}$$