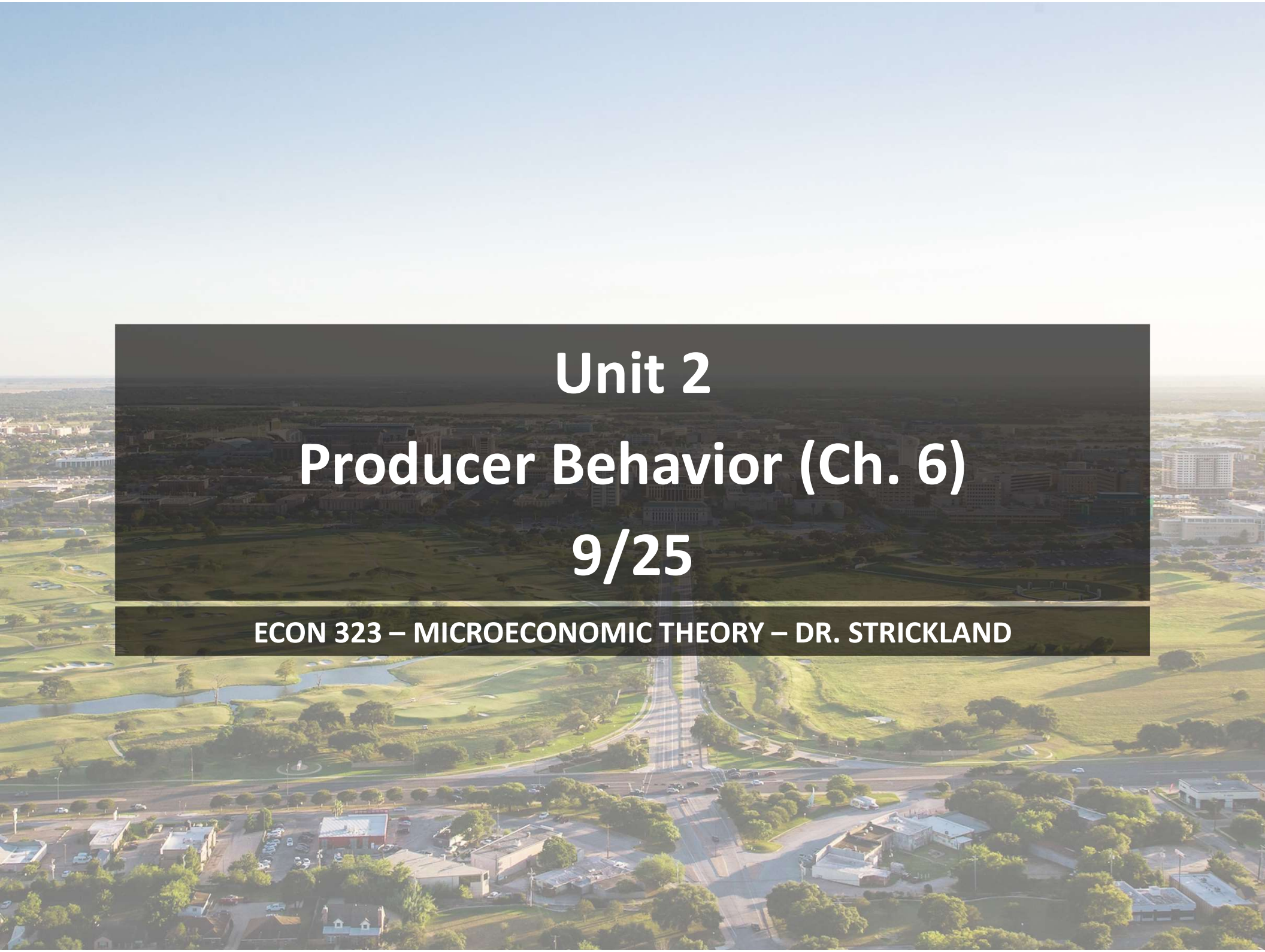


Unit 2
Producer Behavior (Ch. 6)
9/25

ECON 323 – MICROECONOMIC THEORY – DR. STRICKLAND

iClicker

Calculate the marginal product of labor for two workers.

Q	K	L	MPL
10	2	1	10
14.14	2	2	
17.32	2	3	

MPL MOVING FROM L=1 TO L=2

A. 3.17

B. 10

C. 3.41

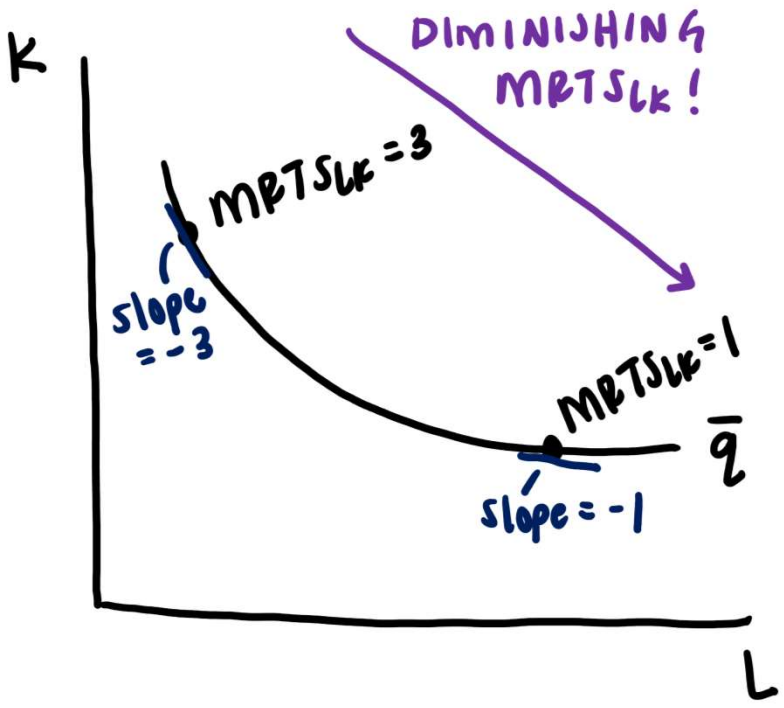
D. 4.14

$$MP_L = \frac{\Delta Q}{\Delta L} = \frac{14.14 - 10}{2 - 1} = 4.14$$

Production in the Long Run

Long run: period in which capital and labor are variable

- Represent input tradeoffs with **isoquants**



$$\text{SLOPE} = \frac{\Delta K}{\Delta L}$$

$$-\frac{\Delta K}{\Delta L} = \text{MARGINAL RATE OF TECHNICAL SUBSTITUTION OF L FOR K } (MRTS_{LK})$$

FIRM CAN TRADE 1 UNIT OF LABOR AND $MRTS_{LK}$ UNITS OF K TO KEEP Q CONSTANT

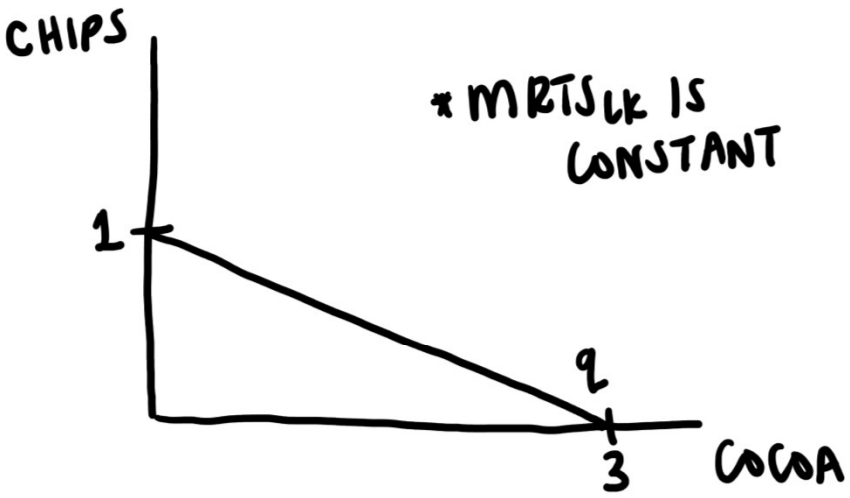
$$MRTS_{LK} = \frac{-\Delta K}{\Delta L} = \frac{MP_L}{MP_K}$$

IMPERFECT SUBS IN PRODUCTION: $q = K^a L^b$

Perfect Substitutes and Perfect Complements in Production

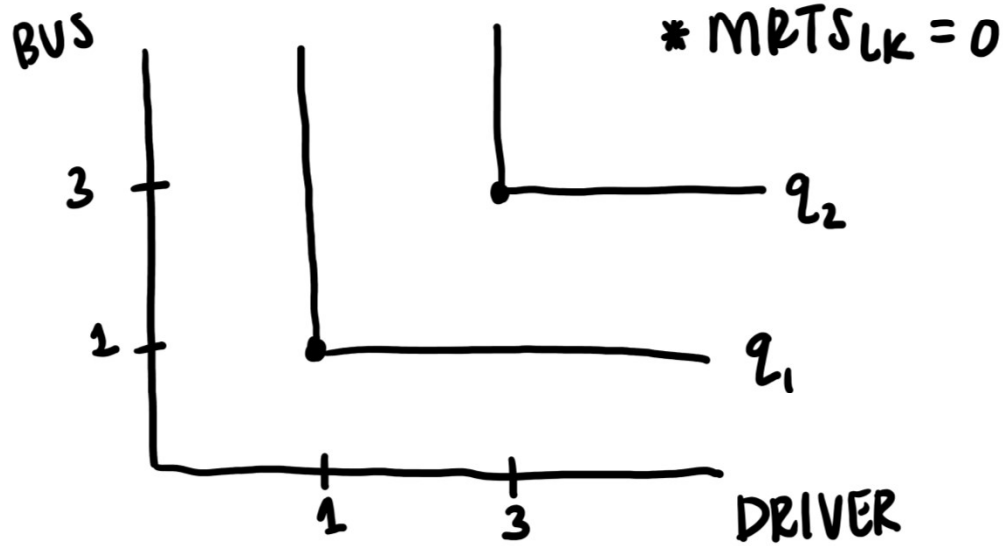
ex. COCOA POWDER + CHOC CHIPS

3 TBSP COCOA OR 1 OZ CHOC CHIPS



$q = ax + by$

ex. 1 DRIVER AND WITH
1 BUS



$q = \min\{ax, by\}$

Isocost Line

Isocost line: shows all input combinations that yield the same cost

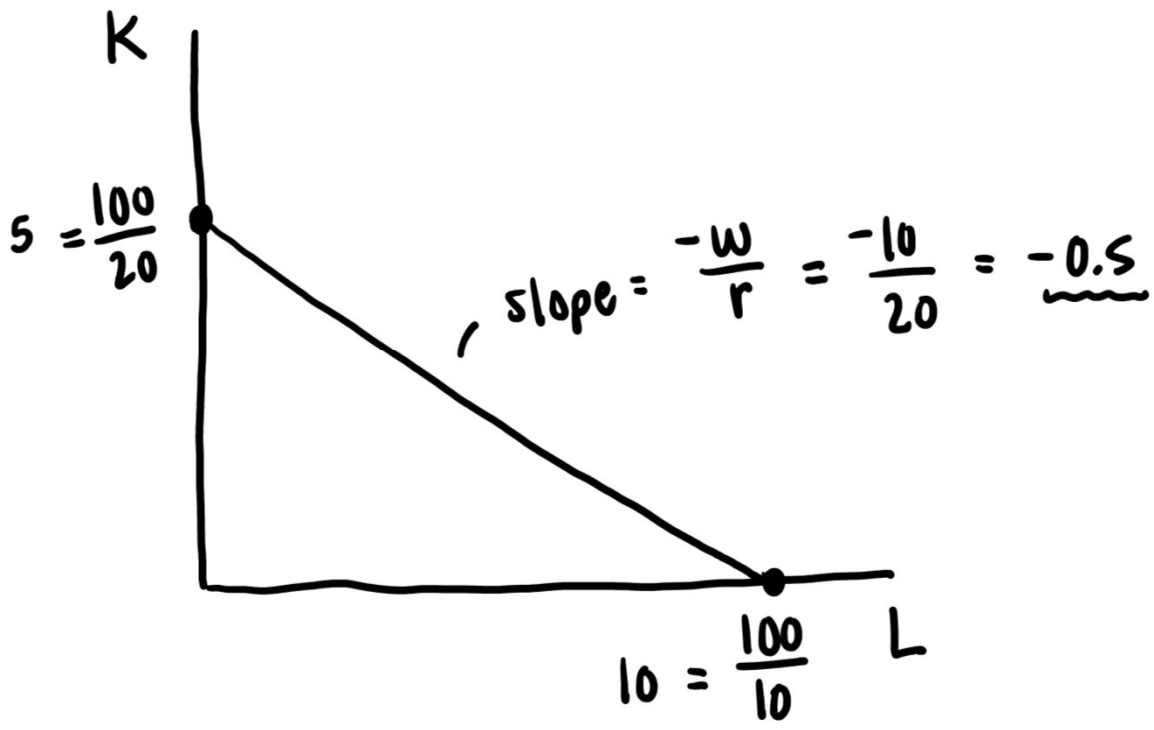
- Like the budget constraint facing consumers

$TC = VC$

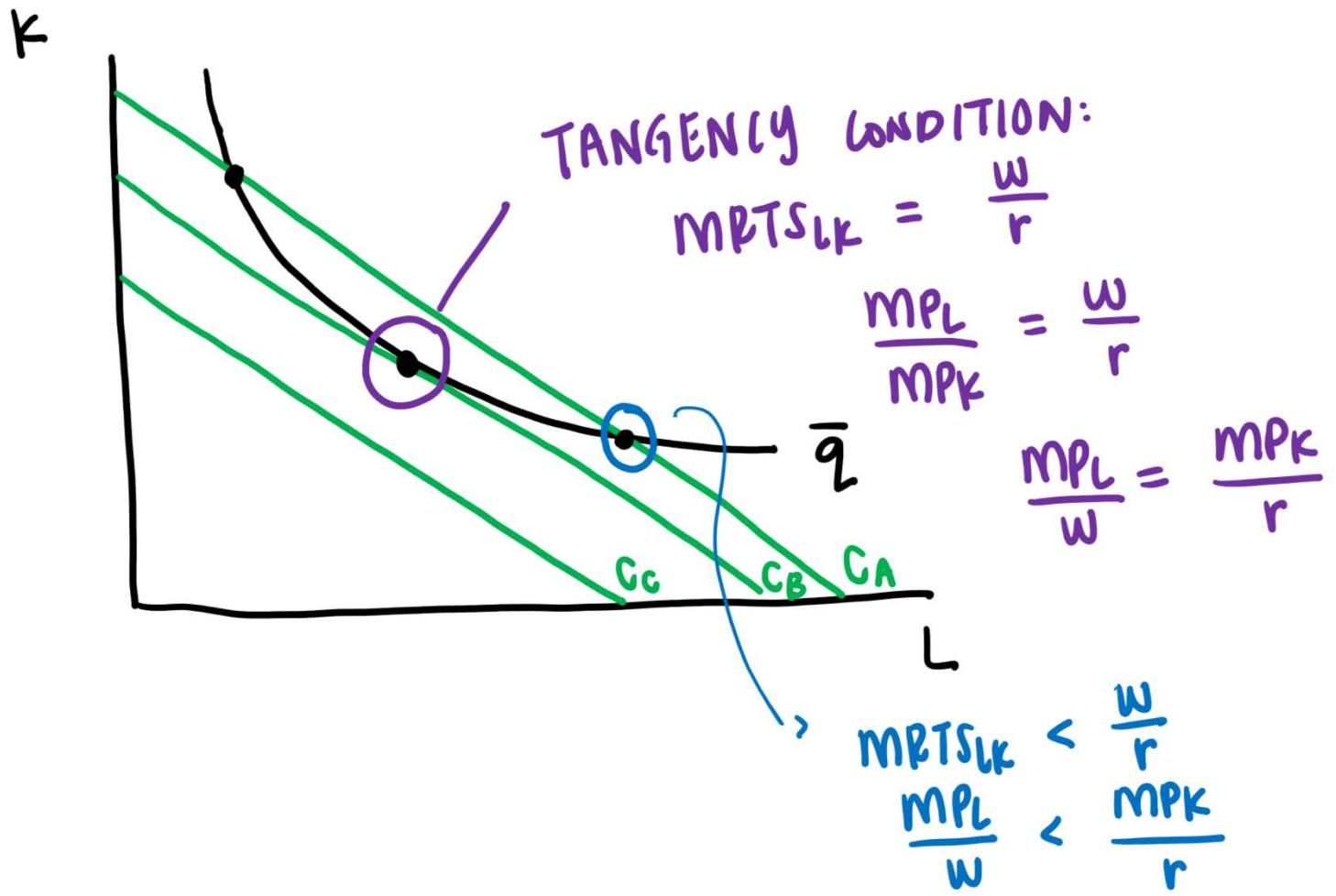
$C = wL + rK$

- C: TOTAL COST
- w: wage
- r: rental rate

ex. $100 = 10L + 20K$



Firm Input Choice: Cost Minimization



Let's practice!

Texas FilmWorks produces digital content (in hours) using equipment (K) and videographers (L). Texas FilmWorks pays videographers $25 per hour (w) and rents equipment for $50 an hour (r).

Suppose Texas FilmWorks has a production function of $Q = 30K^{.67}L^{.33}$ (where Q is hours of content); a marginal product of labor of $9.9K^{.67}L^{-.67}$; and a marginal product of capital of $20.1K^{-.33}L^{.33}$.

Answer the following:

Suppose Texas FilmWorks creates 3,000 hours of content. How many videographers and equipment will the company use to minimize costs?

$Q = 30K^{.67}L^{.33}$; MPL = $9.9K^{.67}L^{-.67}$; MPK = $20.1K^{-.33}L^{.33}$; w=\$25, r=\$50, $\bar{Q}$=3,000

① TANGENCY CONDITION: $MRTS_{LK} = \frac{w}{r}$

$$MRTS_{LK} = \frac{MPL}{MPK} = \frac{9.9K^{0.67}L^{-0.67}}{20.1K^{-0.33}L^{0.33}} = 0.49K^{1}L^{-1} = \frac{0.49K}{L}$$

$$\frac{0.49K}{L} = \frac{25}{50} \Rightarrow 24.5K = 25L \Rightarrow K = 1.02L$$

"OPTIMAL PRODUCTION RATIO" (OPR)

"COST-MINIMIZING RATIO"

② PLUG OPR INTO PRODUCTION FUNCTION & SET EQUAL TO $\bar{Q}$

$$\bar{Q} = 3{,}000 = 30K^{0.67}L^{0.33}$$

$$3{,}000 = 30(1.02L)^{0.67}L^{0.33}$$

$$3{,}000 = 30(1.02)^{0.67}L^{0.67}L^{0.33}$$

$$3{,}000 = 30(1.02)^{0.67}L$$

$$\boxed{L^* = 99.01}$$

③ PLUG BACK INTO OPR

$$K^* = 1.02L^*$$

$$K^* = 1.02(99.01) = \boxed{100.99}$$