Cost Curves

- Average Costs
- Marginal Costs
- Long run and Short Run

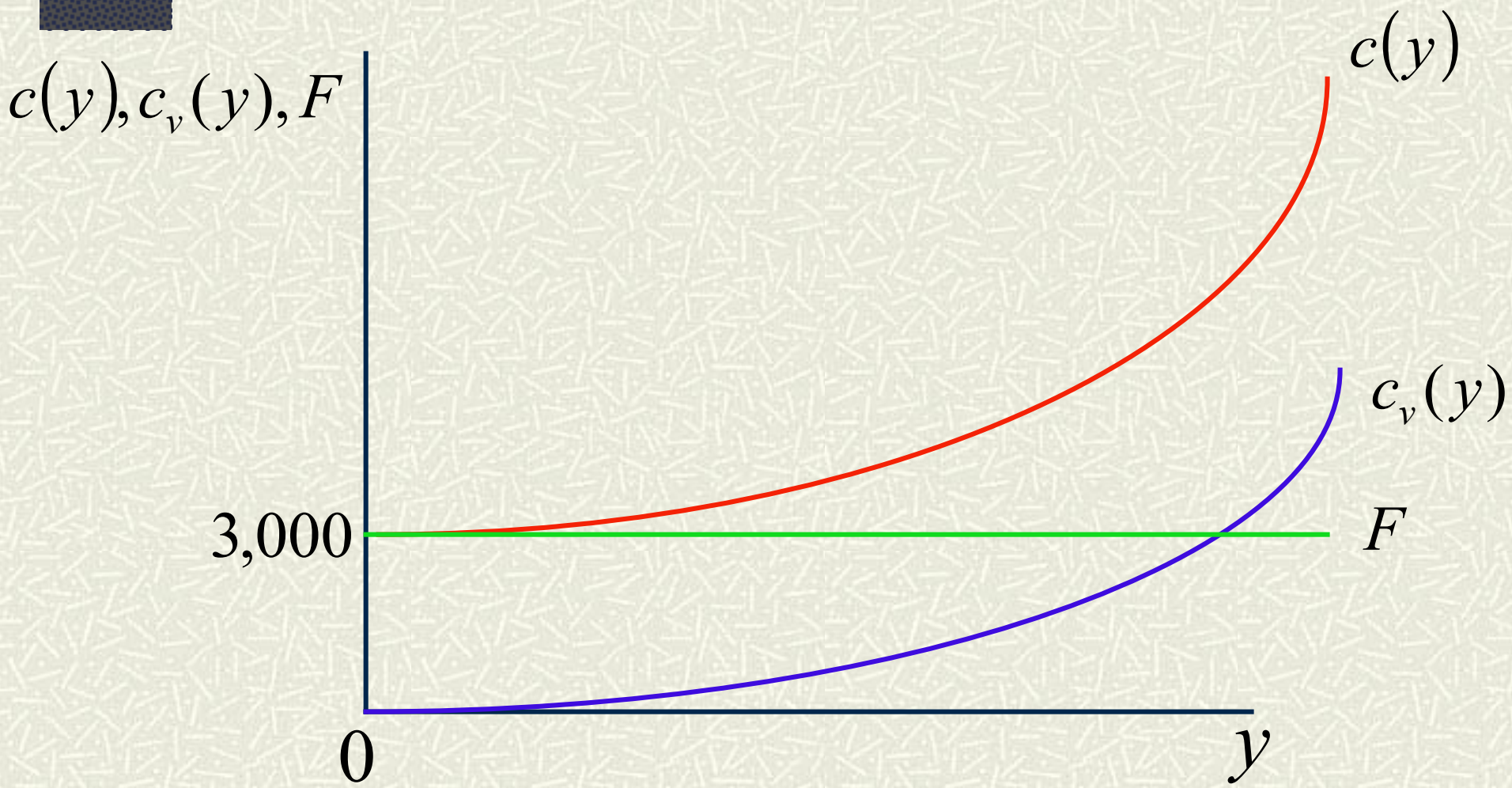
Cost Function

In our example, the **short-run** cost function was:

$$c(y) = \left[\frac{70}{(3{,}000)^{\frac{1}{3}}} \right] y^{\frac{5}{3}} + 3{,}000$$

Variable costs $c_v(y)$ **Fixed costs** F

Cost Curve



Average Cost Function

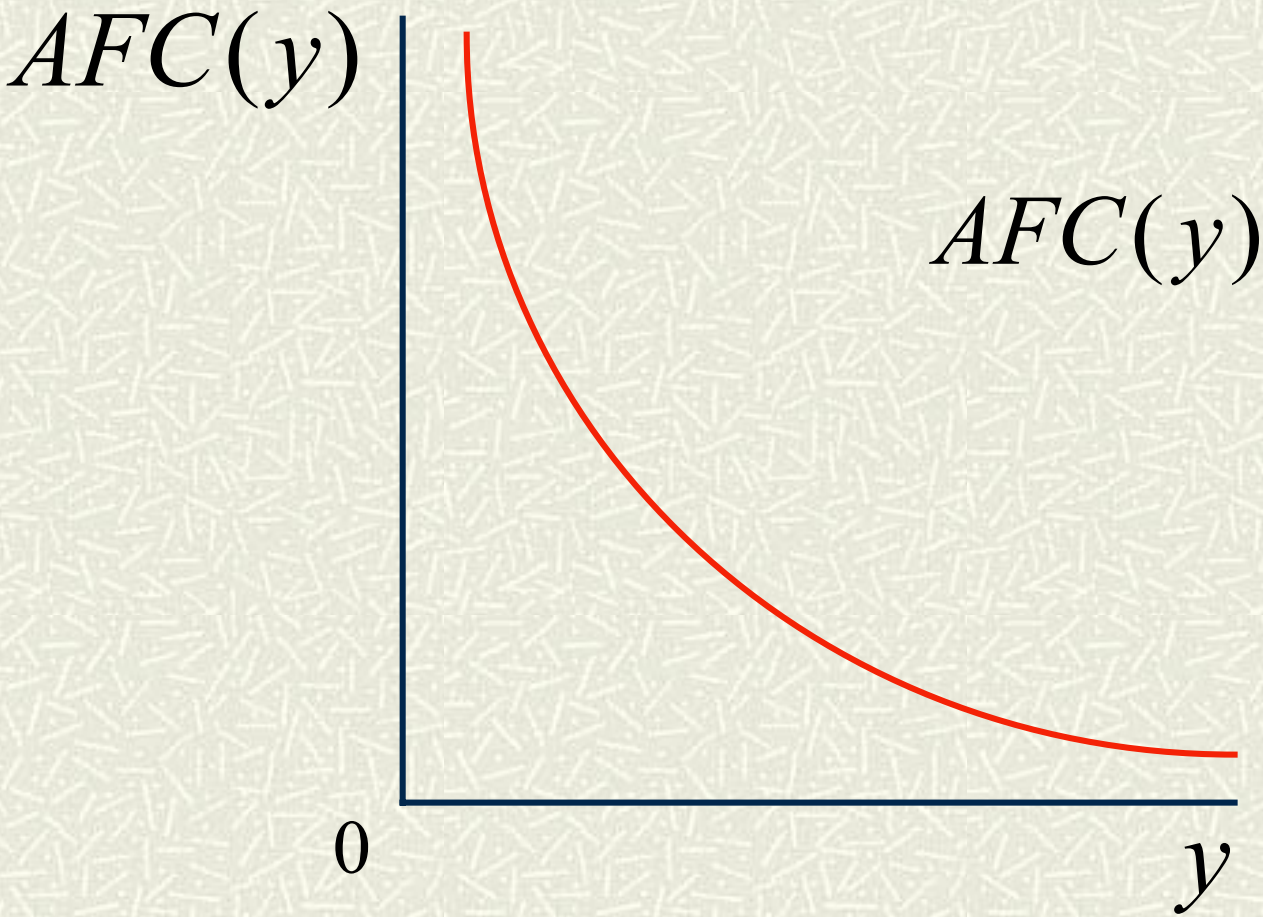
The **short run** average cost function:

$$AC(y) = \frac{c(y)}{y} = \left[\frac{70}{(3{,}000)^{\frac{1}{3}}}\right] y^{\frac{2}{3}} + \frac{3{,}000}{y}$$

Average variable cost $AVC(y)$

Average fixed cost $AFC(y)$

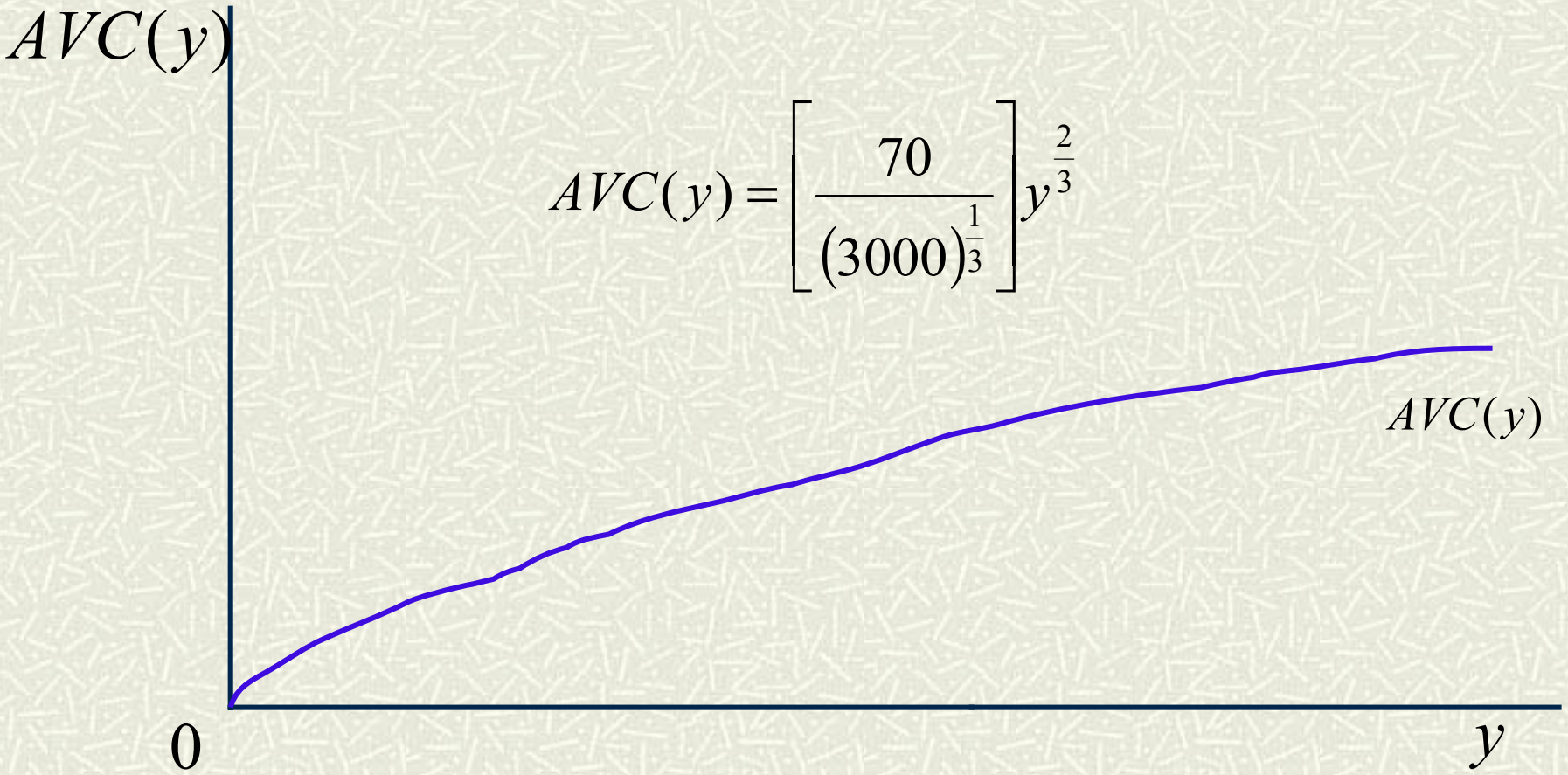
Average Fixed Cost Curve



$$AFC(y) = \frac{3{,}000}{y}$$

Average Variable Cost Curve

$$AVC(y) = \left[\frac{70}{(3000)^{\frac{1}{3}}}\right] y^{\frac{2}{3}}$$



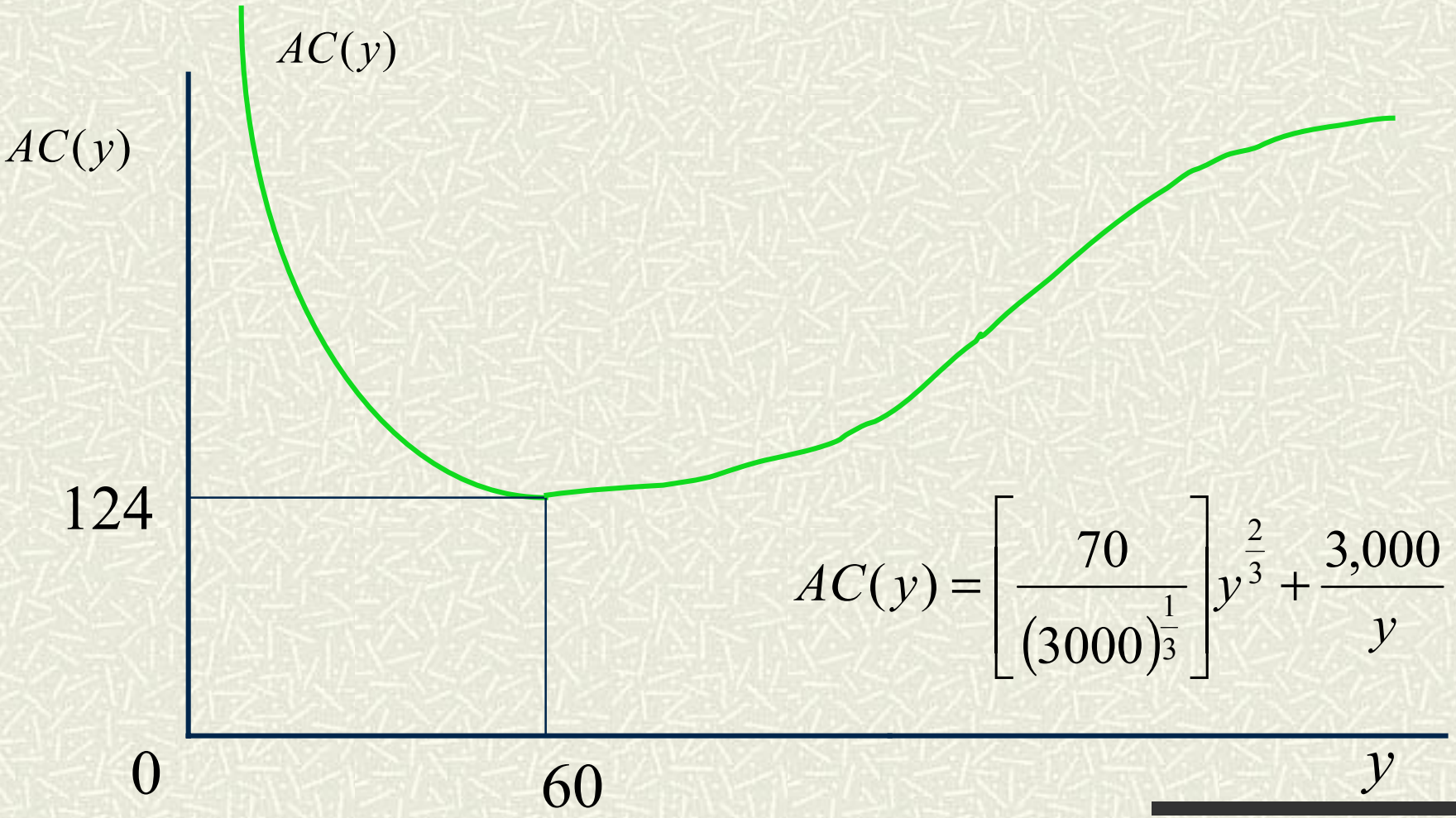
Why is AVC Increasing in y?

- Production function and AVC:

$$y = (3{,}000)^{0.2}(x_l)^{0.6} \longrightarrow AVC(y) = \left[\frac{70}{(3000)^{\frac{1}{3}}}\right] y^{\frac{1}{0.6}-1}$$

- Productions function features **decreasing returns to scale** wrt x_l

Average Cost Curve



$$AC(y) = \left[\frac{70}{(3000)^{\frac{1}{3}}}\right] y^{\frac{2}{3}} + \frac{3{,}000}{y}$$

Marginal Cost Function

- The **short run** cost function:

$$MC(y) = \frac{\partial c(y)}{\partial y} = \frac{\partial c_v(y)}{\partial y}$$

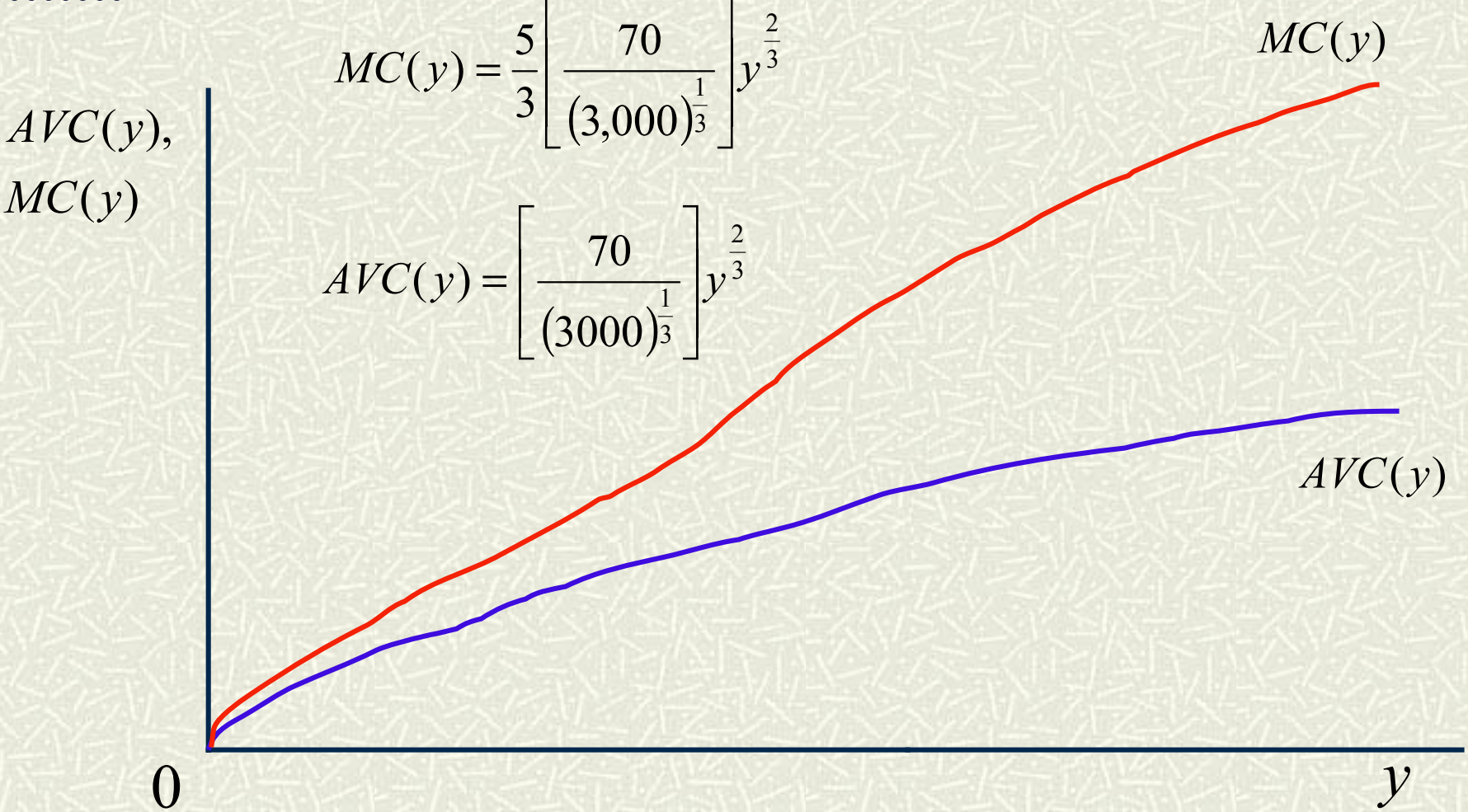
- The **short run** marginal cost function:

$$MC(y) = \frac{5}{3}\left[\frac{70}{(3{,}000)^{\frac{1}{3}}}\right] y^{\frac{2}{3}}$$

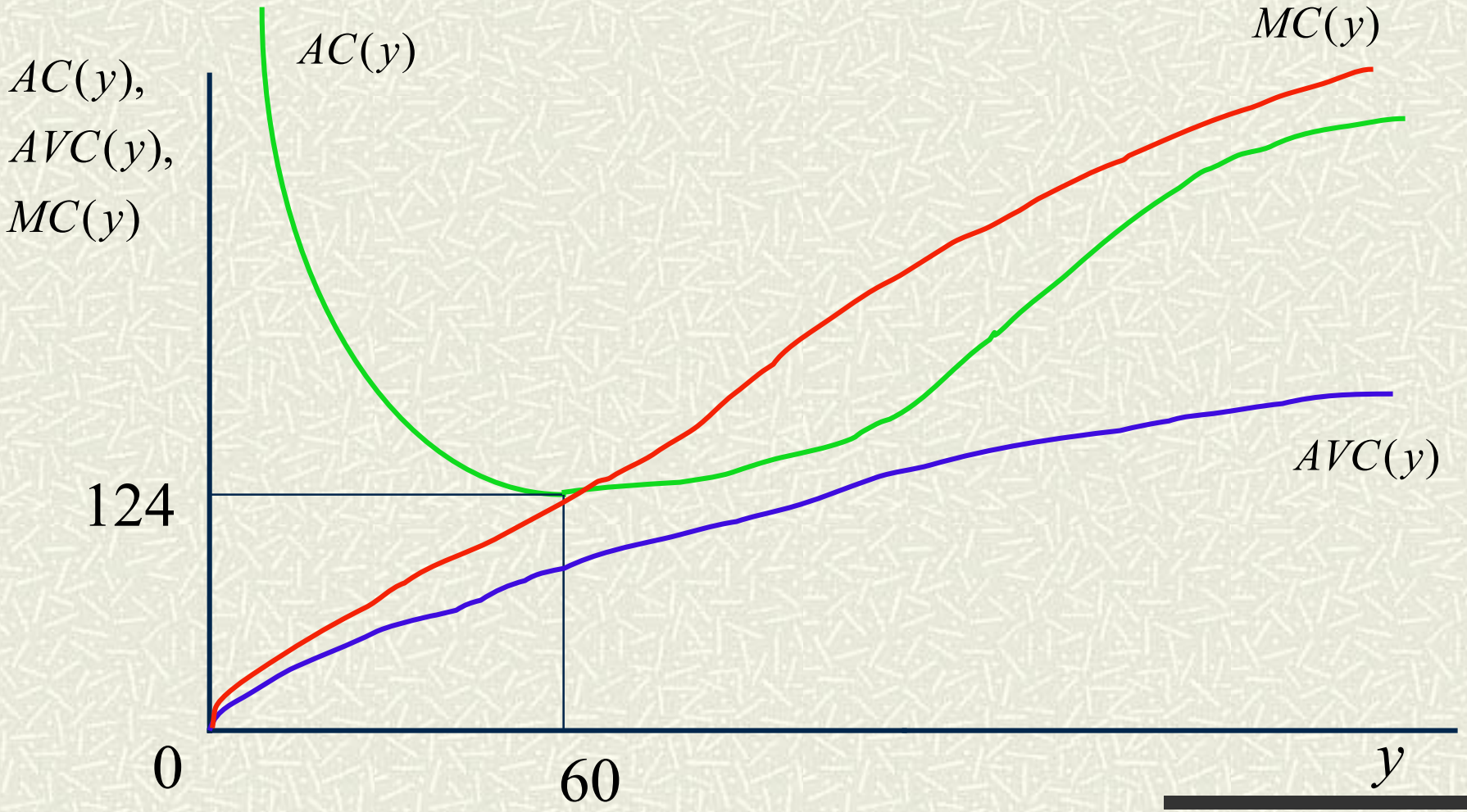
Marginal and Average Variable Cost Curves

$$MC(y) = \frac{5}{3}\left[\frac{70}{(3{,}000)^{\frac{1}{3}}}\right] y^{\frac{2}{3}}$$

$$AVC(y) = \left[\frac{70}{(3000)^{\frac{1}{3}}}\right] y^{\frac{2}{3}}$$

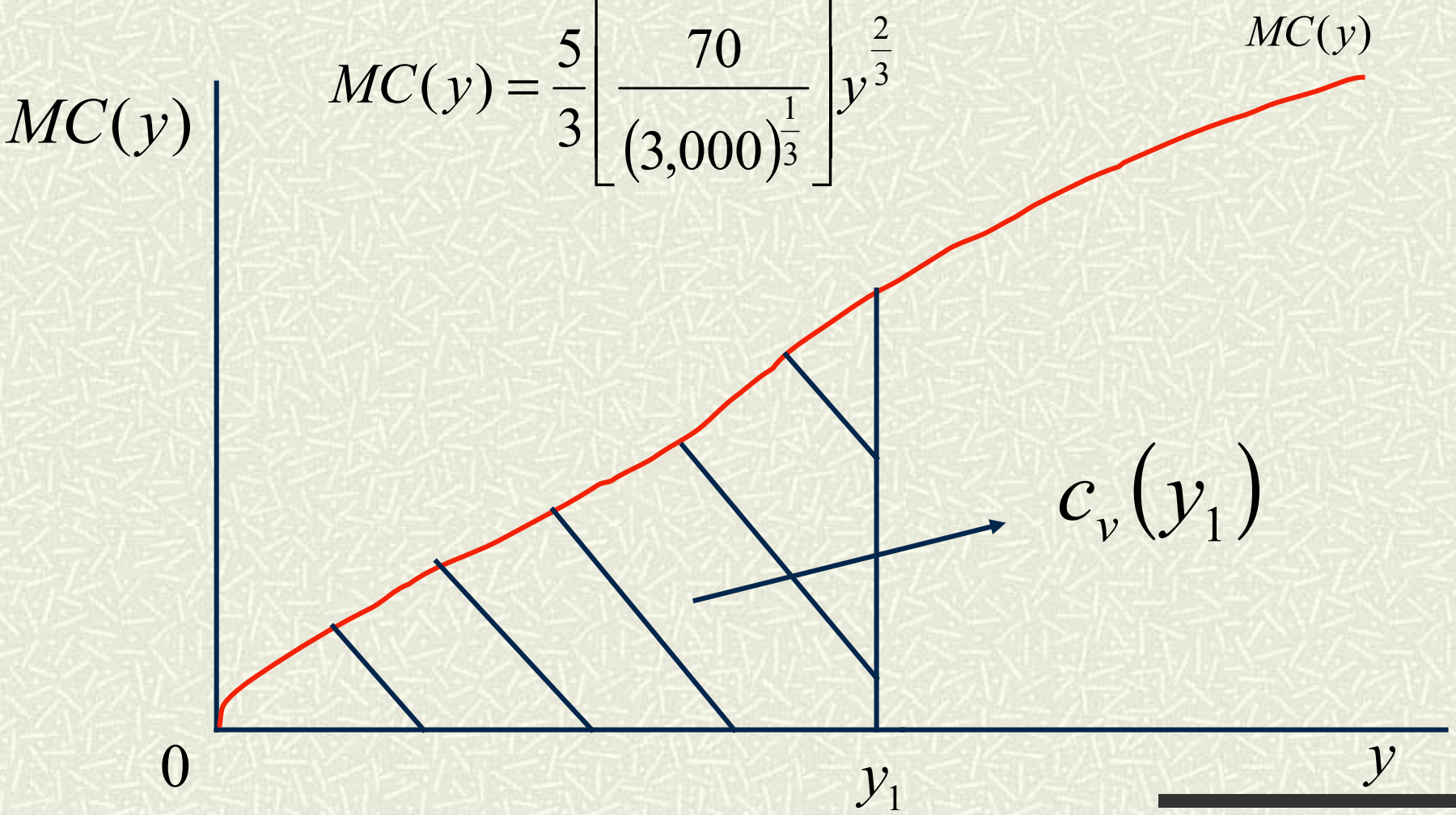


Marginal and Average Cost Curves



Variable Costs and the Marginal Cost Curve

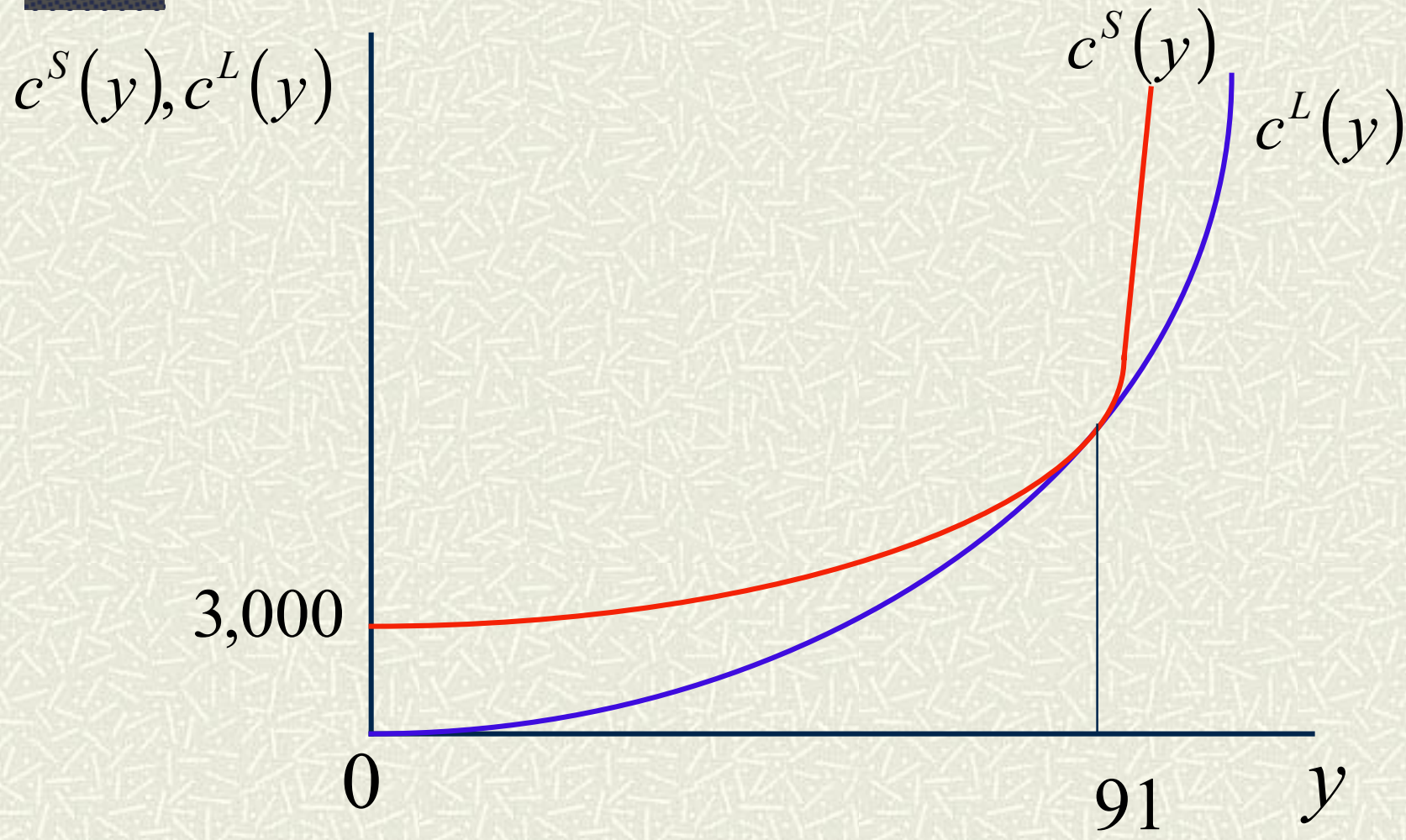
$$MC(y) = \frac{5}{3}\left[\frac{70}{(3{,}000)^{\frac{1}{3}}}\right] y^{\frac{2}{3}}$$



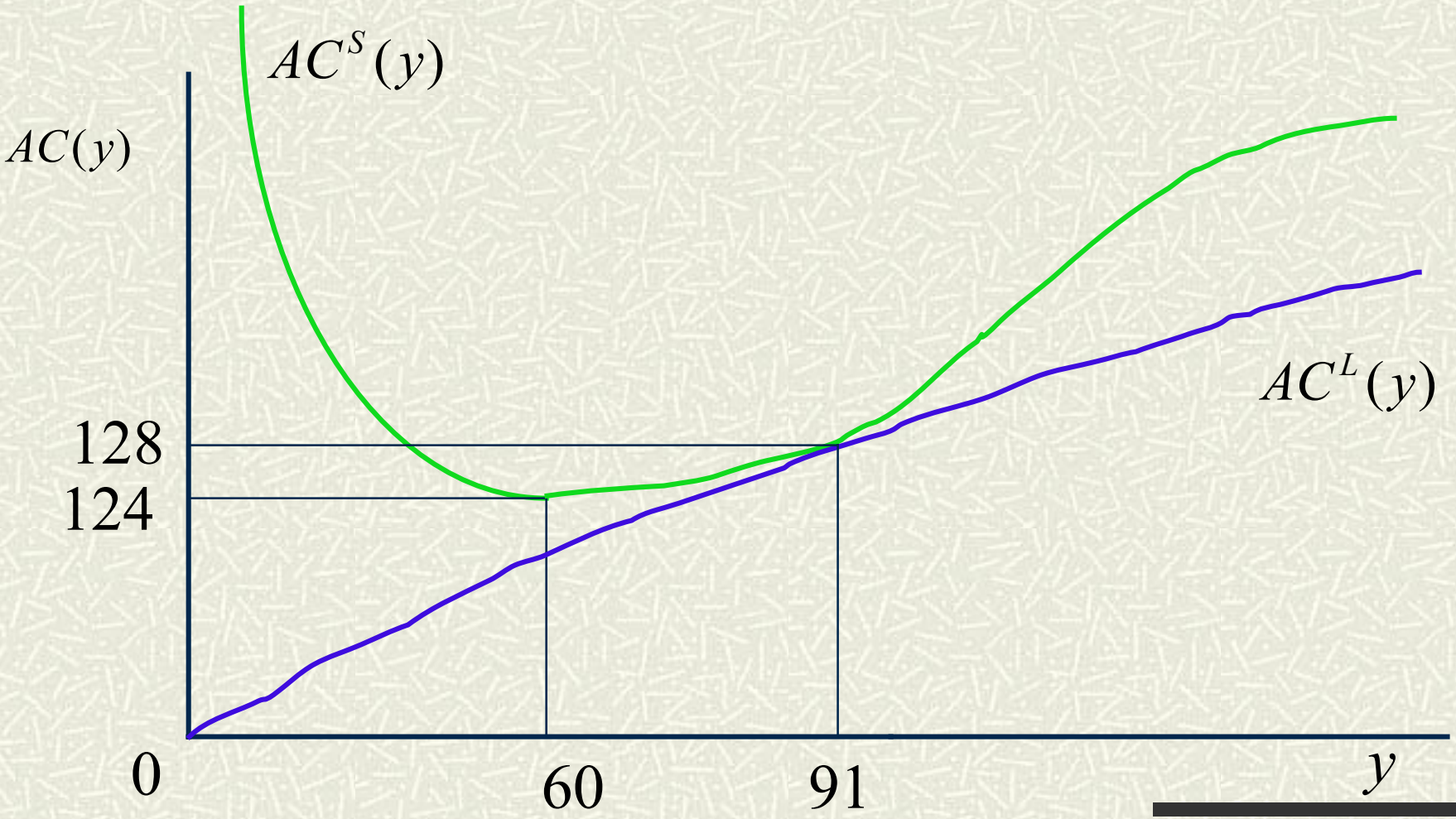
Long Run

- In the long run there are **no fixed factors** of production
- Firm can freely adjust inputs
- Production costs are **lower** in the long run

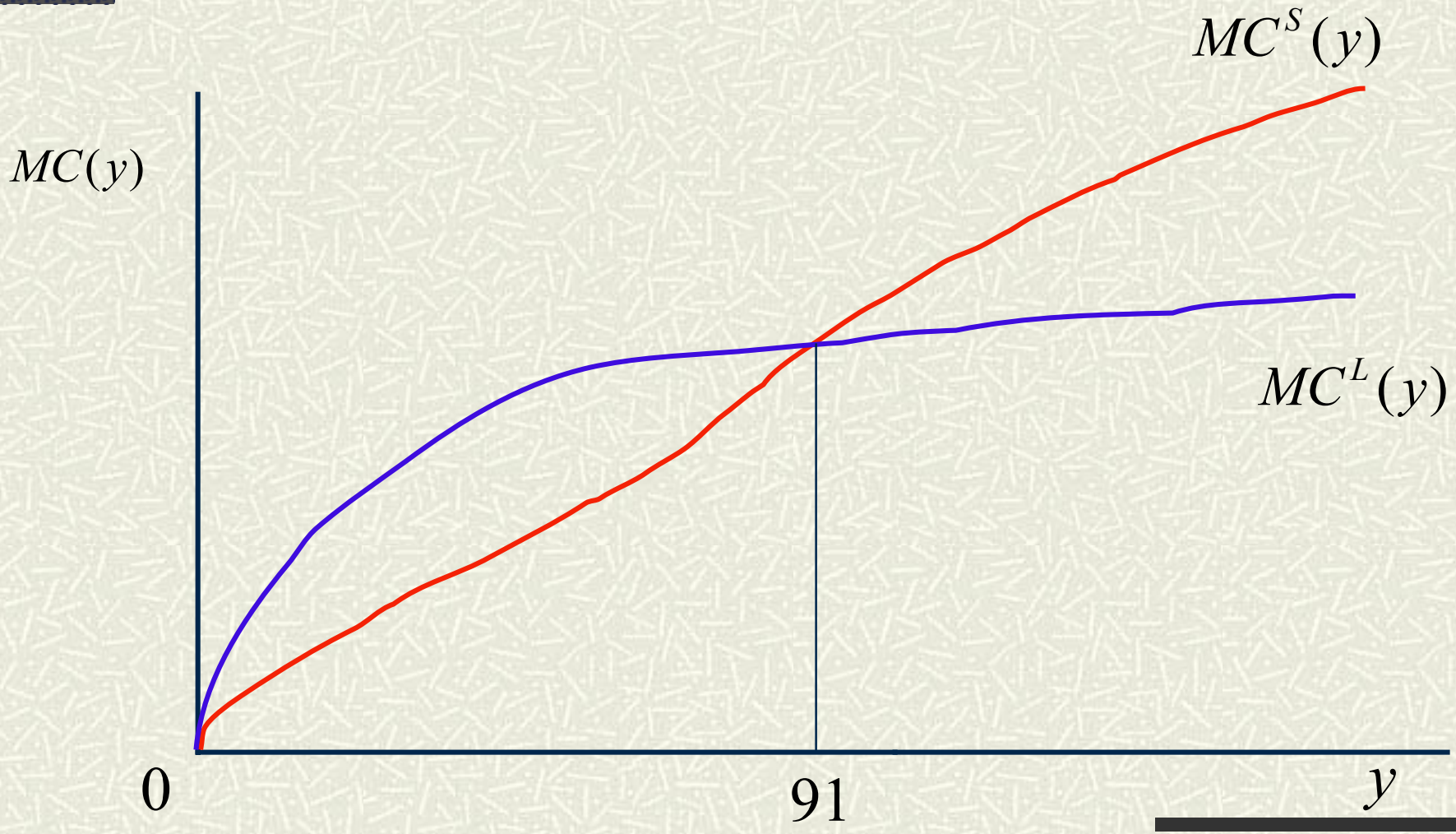
Long and Short Run Cost Curves



Long and Short Run Average Cost Curves



Long and Short Run Marginal Cost Curves



Long and Short Run Cost Functions

$$c^L(y) = 70\left(\frac{3}{70}\right)^{\frac{1}{4}}\frac{4}{3}y^{\frac{5}{4}}$$

$$c^S(y) = 70\left[\frac{1}{(3{,}000)^{\frac{1}{3}}}\right]y^{\frac{5}{3}} + 3{,}000$$