These slides are by courtesy of Prof. 李稻葵 and Prof. 郑捷.

Chapter Twenty-Five

Monopoly

Pure Monopoly

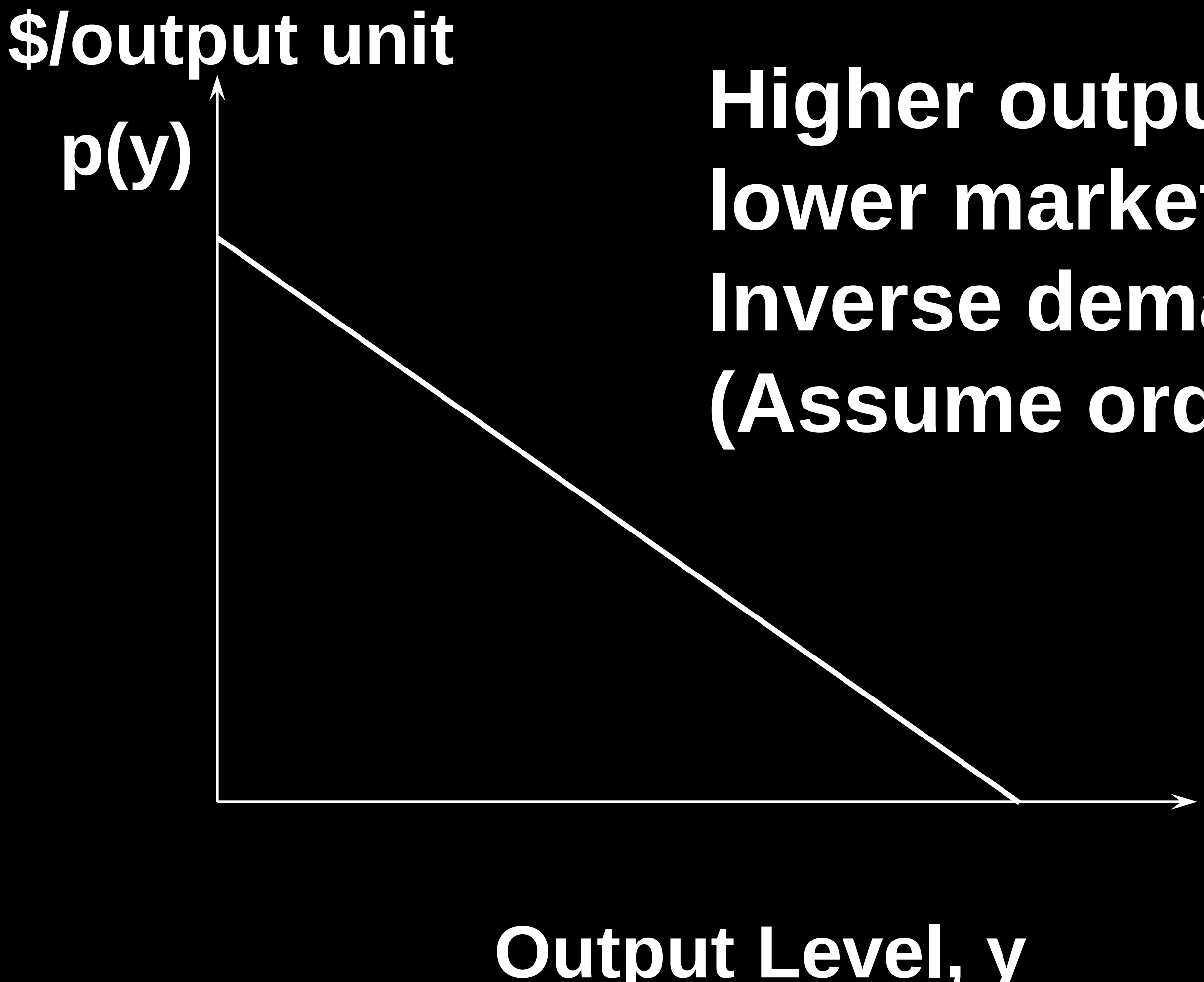
- **Previous chapters**
  - **An industry with price-taking producers**

- **This chapter**
  - **An industry with only one producer, i.e. pure monopoly**
  - **The producer is called the monopolist**

Pure Monopoly

- **The monopolist is faced with the market demand curve.**
- **The monopolist is not a price-taker**
  - **It can change the market price p by adjusting its output level q.**
- **In this sense, we say that the monopolist has market power.**

Pure Monopoly



Higher output y causes a lower market price

Inverse demand: p(y)

(Assume ordinary good)

Pure Monopoly

- Suppose that the monopolist seeks to maximize its profit,

$$\Pi(y) = p(y)y - c(y).$$

- What output level y* maximizes profit?

Profit-Maximization

$$\Pi(y) = p(y)y - c(y).$$

At the profit-maximizing output level y*

$$\frac{d\Pi(y)}{dy} = \frac{d}{dy}\left(p(y)y\right) - \frac{dc(y)}{dy} = 0$$

So at y = y*, we have MR = MC

$$\frac{d}{dy}\left(p(y)y\right) = \frac{dc(y)}{dy}.$$

Marginal Revenue

Marginal revenue:

$$MR(y) = \frac{d}{dy}\big(p(y)y\big) = p(y) + y\frac{dp(y)}{dy}.$$

Assuming dp(y)/dy < 0, we have

$$MR(y) = p(y) + y\frac{dp(y)}{dy} \quad < \quad p(y)$$

when y > 0.

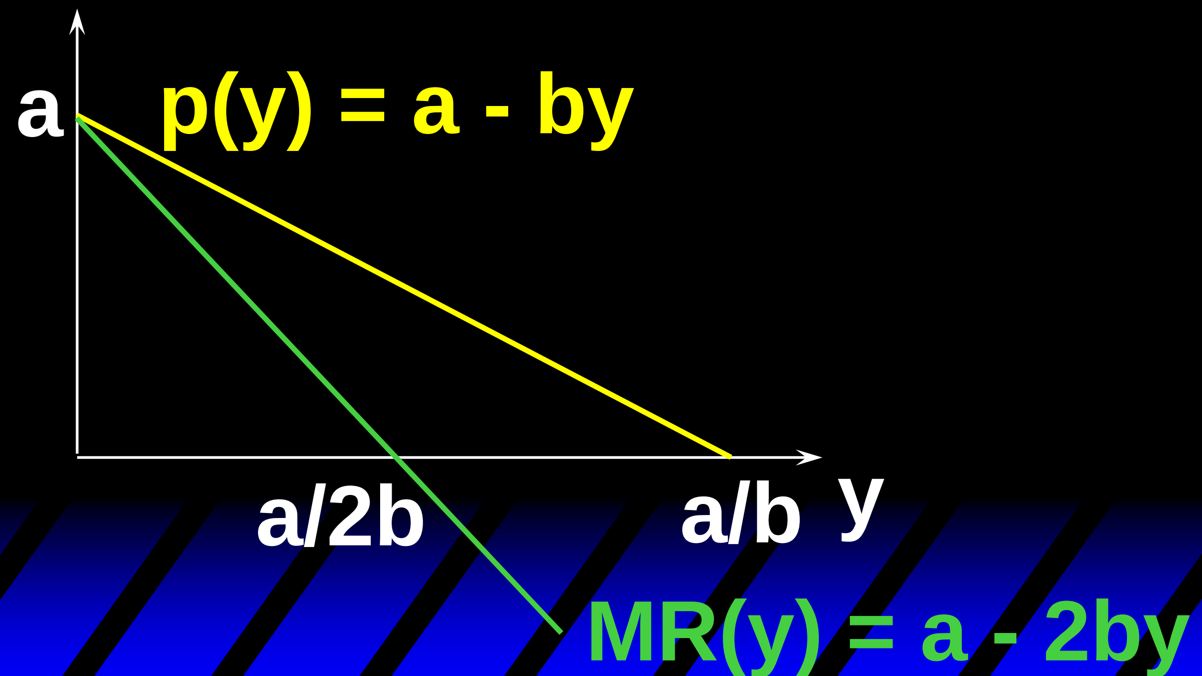
Marginal Revenue

E.g. if $p(y) = a - by$ then

$$R(y) = p(y)y = ay - by^2$$

and so

$MR(y) = a - 2by < a - by = p(y)$ for $y > 0$.



Marginal Cost

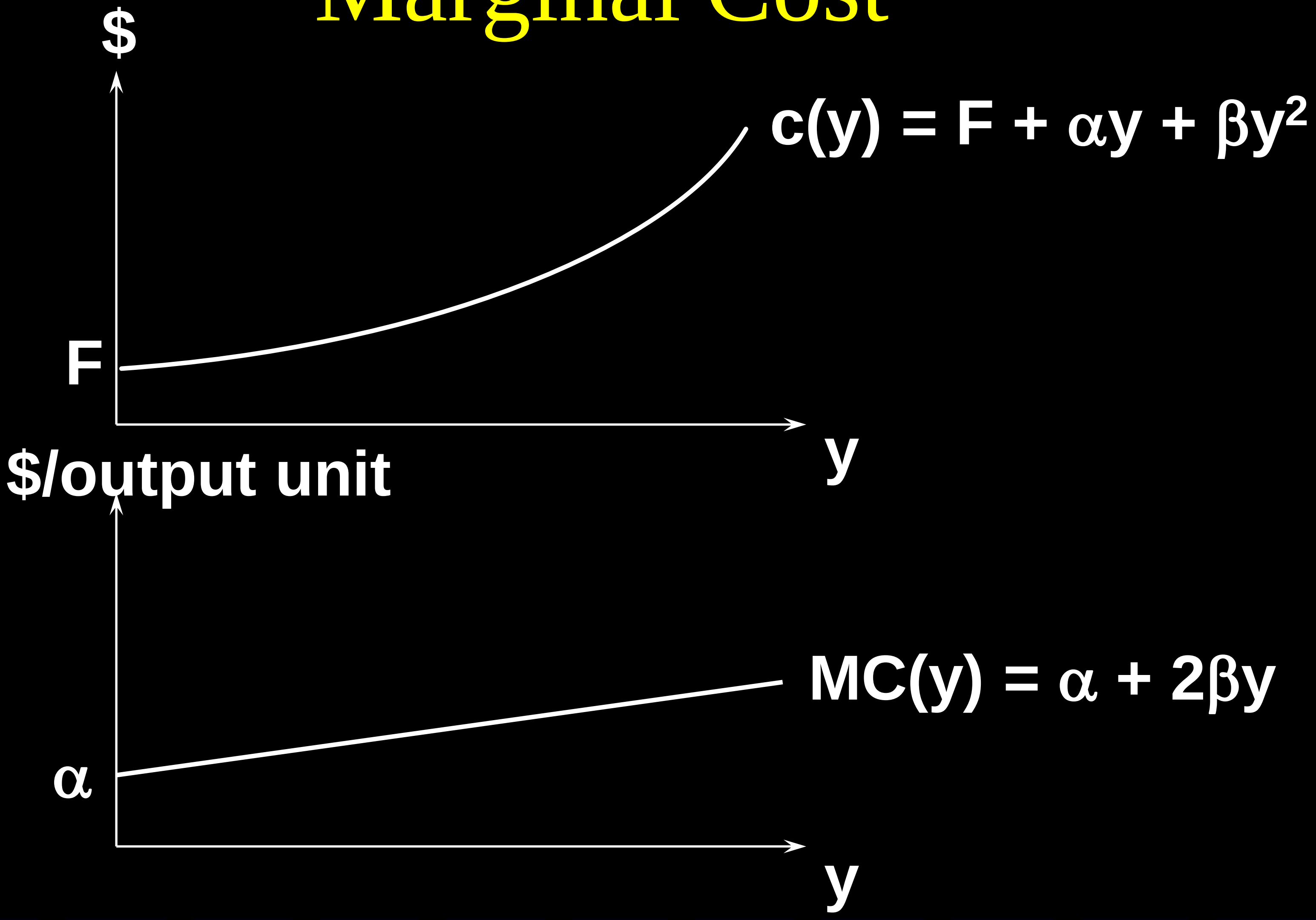
Marginal cost:

$$MC(y) = \frac{dc(y)}{dy}.$$

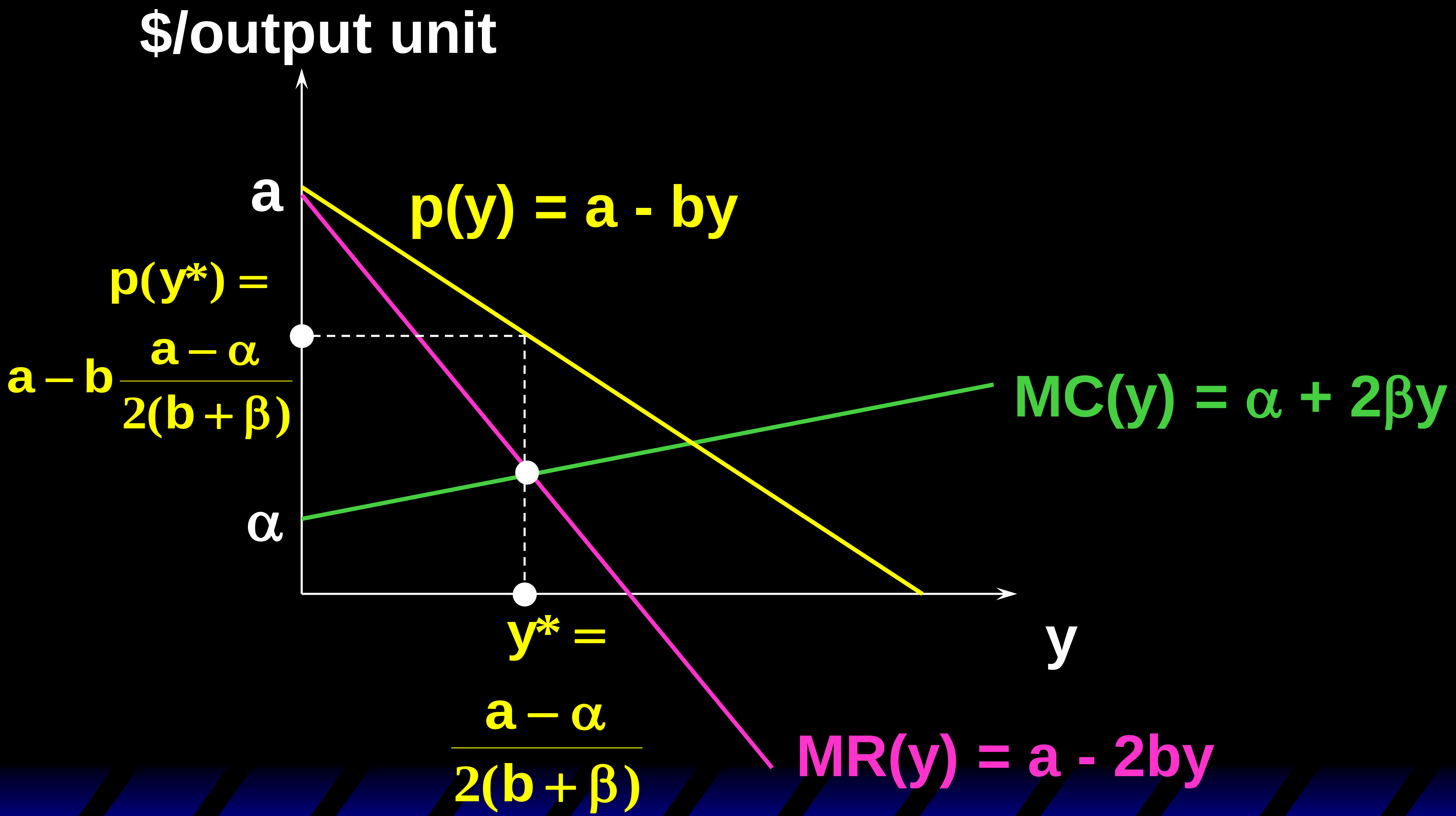
E.g. if $c(y) = F + \alpha y + \beta y^2$ then

$$MC(y) = \alpha + 2\beta y.$$

Marginal Cost



Profit Maximized at y* or 0



Recall Elasticity

$$MR(y) = \frac{d}{dy}\left(p(y)y\right) = p(y) + y\frac{dp(y)}{dy}$$

$$= p(y)\left[1 + \frac{y}{p(y)}\frac{dp(y)}{dy}\right] = p(y)\left[1 + \frac{1}{\varepsilon(y)}\right]$$

where

$$\varepsilon(y) = \frac{p(y)}{y}\frac{dy}{dp(y)}$$

is the own-price elasticity of demand.

Monopolistic Pricing & Elasticity

$$MR(y) = p(y)[1 + \frac{1}{\varepsilon(y)}]$$

Suppose the monopolist finds y*>0 to be the optimal quantity. We must have $MR(y^*) = MC(y^*)$, i.e.

$$p(y^*)\left[1 + \frac{1}{\varepsilon(y^*)}\right] = c'(y^*)$$

Monopolistic Pricing & Elasticity

Rearrange the terms, we have:

$$p(y^*) = \frac{c'(y^*)}{1 + \varepsilon(y^*)^{-1}}$$

- **Because $\varepsilon(y^*) < 0$, we have $p(y^*) > c'(y^*)$.**
- **That is, the monopolist's optimal pricing specifies p > MC.**
- **Recall that price-taker assumption implies p = MC.**

Monopolistic Pricing & Elasticity

- In addition, note that the monopolist never chooses to produce at a level y with $|\varepsilon(y)| \leq 1$.
  - At such y, we must have $MR(y) \leq 0 < MC(y)$, and so decreasing y a little will increase the profit.
- "A monopolist never produces at a quantity at which market demand is inelastic."

Markup

- **Markup**: price – MC
- Markup size:

$$p(y^*) - c'(y^*) = \frac{c'(y^*)}{1 + \varepsilon(y^*)^{-1}} - c'(y^*)$$

$$= \frac{c'(y^*)}{|\varepsilon(y^*)| - 1}$$

- Markup percentage

$$\frac{p(y^*) - c'(y^*)}{c'(y^*)} = \frac{1}{|\varepsilon(y^*)| - 1}$$

- **Lower demand elasticity is associated with higher markup.**

A Profits Tax Levied on a Monopoly

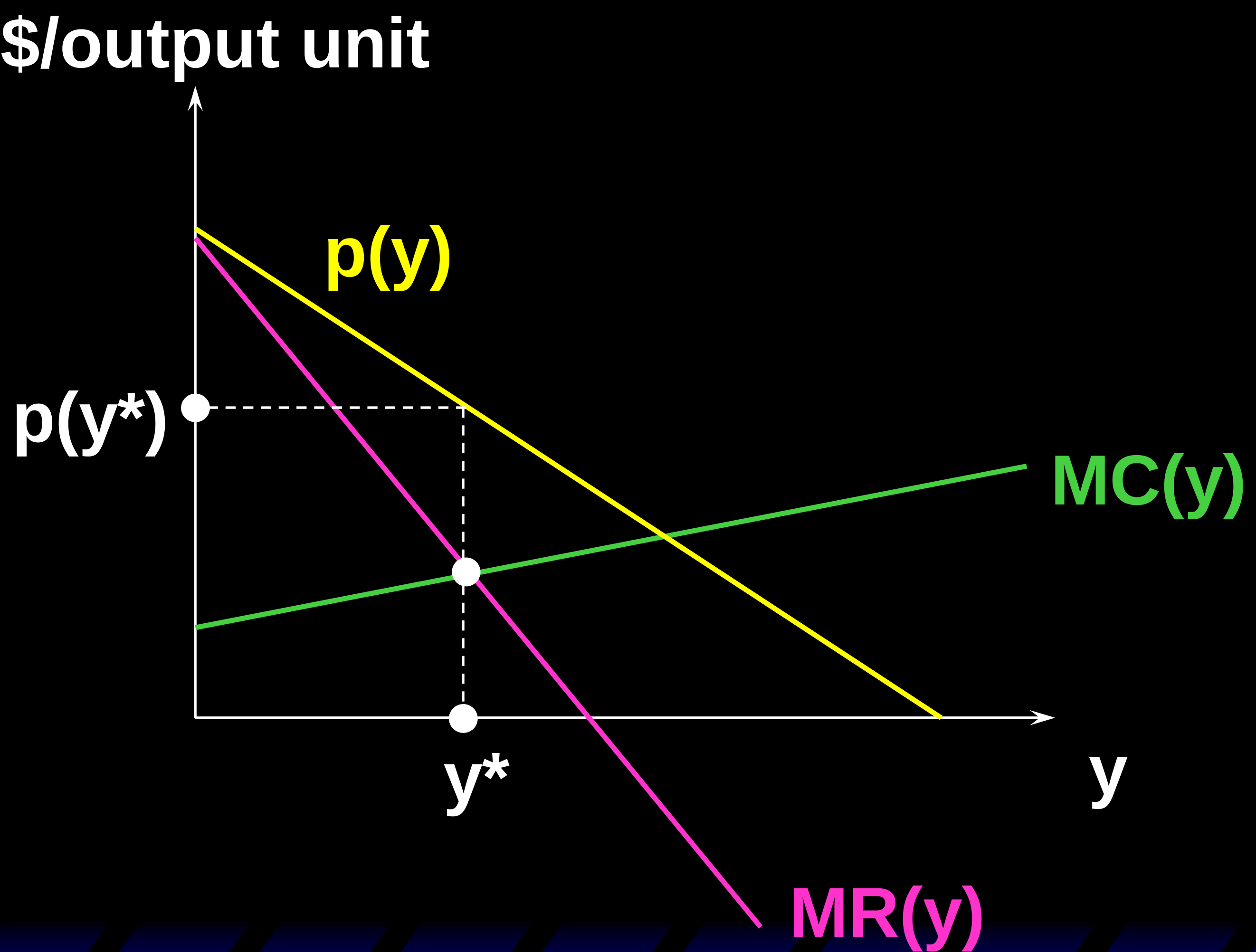
- A profits tax levied at rate t reduces profit from $\Pi(y^*)$ to $(1-t)\Pi(y^*)$.
- What is the impact of t on y*?

- Zero impact
  - So we say that the profits tax is a **neutral tax**.

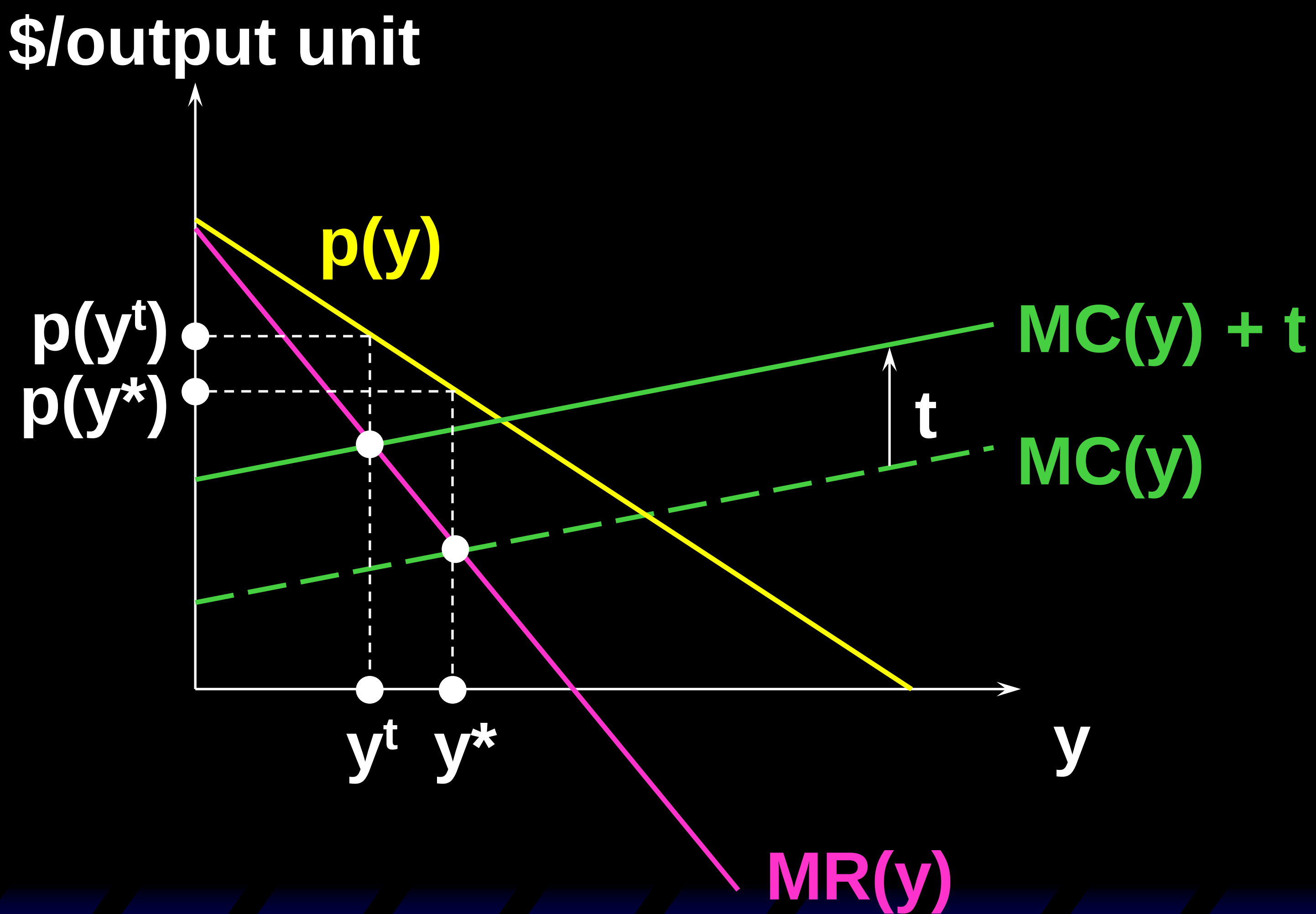
Quantity Tax Levied on a Monopolist

- A quantity tax of $t/output unit raises the marginal cost of production by $t.
- The quantity tax is distortionary.

Quantity Tax Levied on a Monopolist



Quantity Tax Levied on a Monopolist

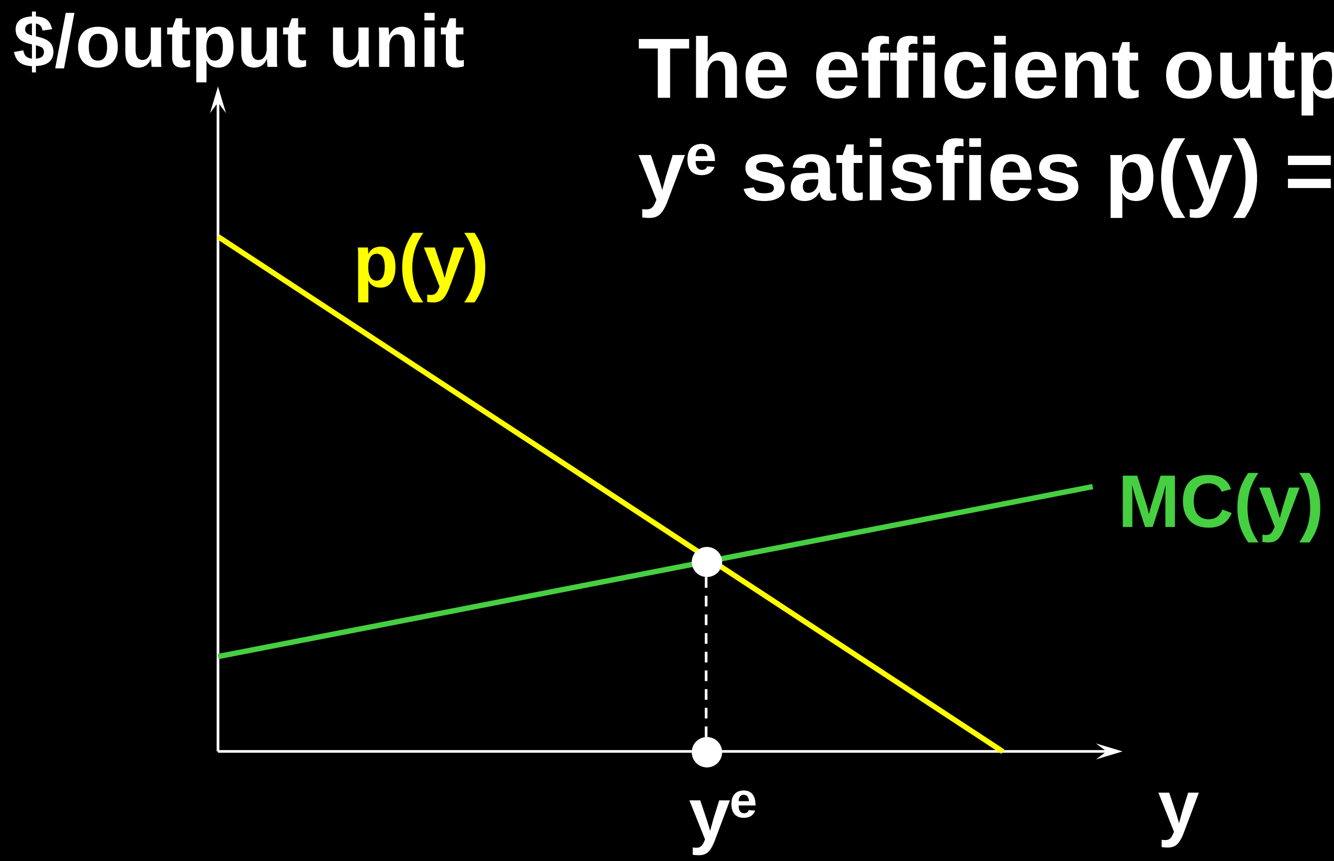


The Inefficiency of Monopoly

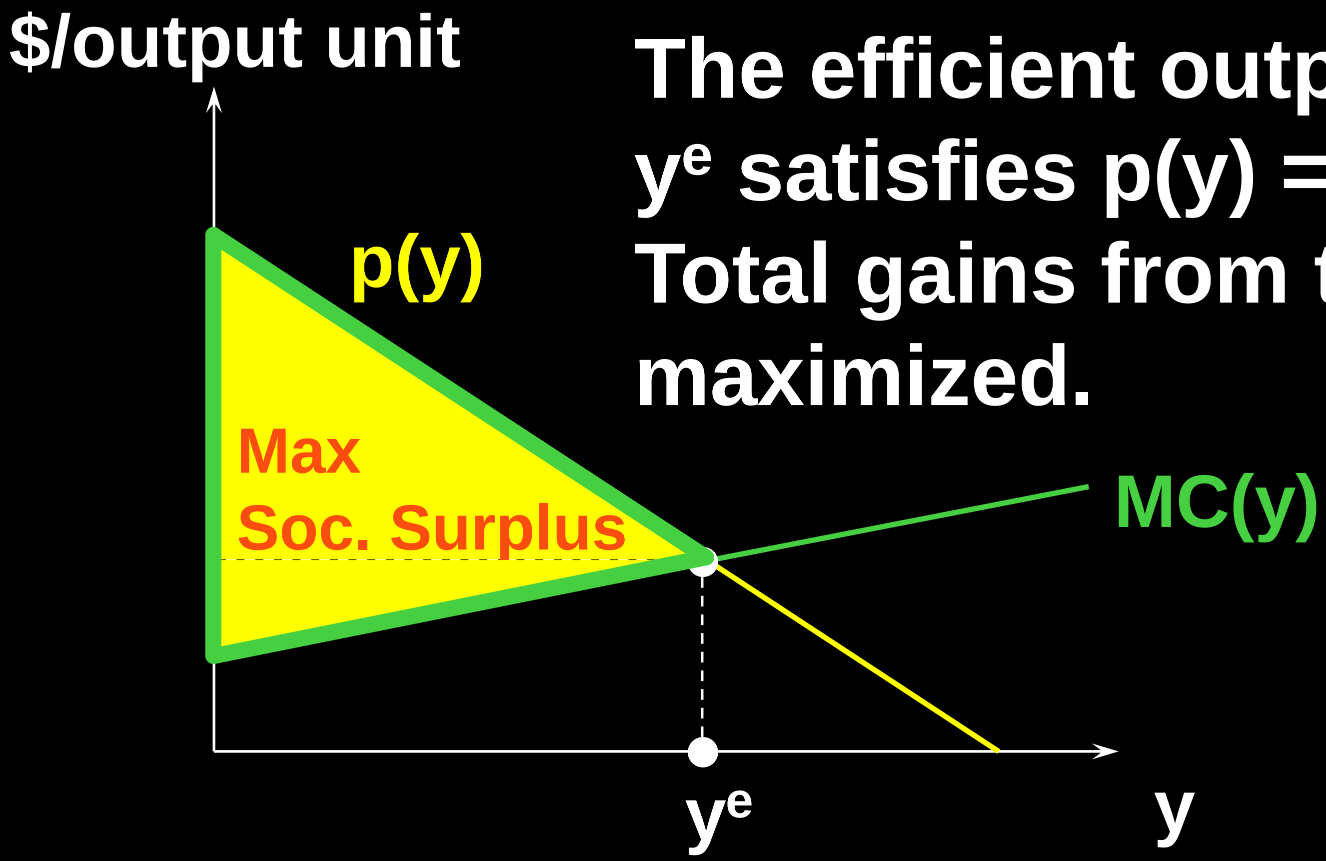
- **Recall the notion of Pareto efficient:**
  - **No Pareto improvement**

The Inefficiency of Monopoly

The efficient output level y^e satisfies $p(y) = MC(y)$.

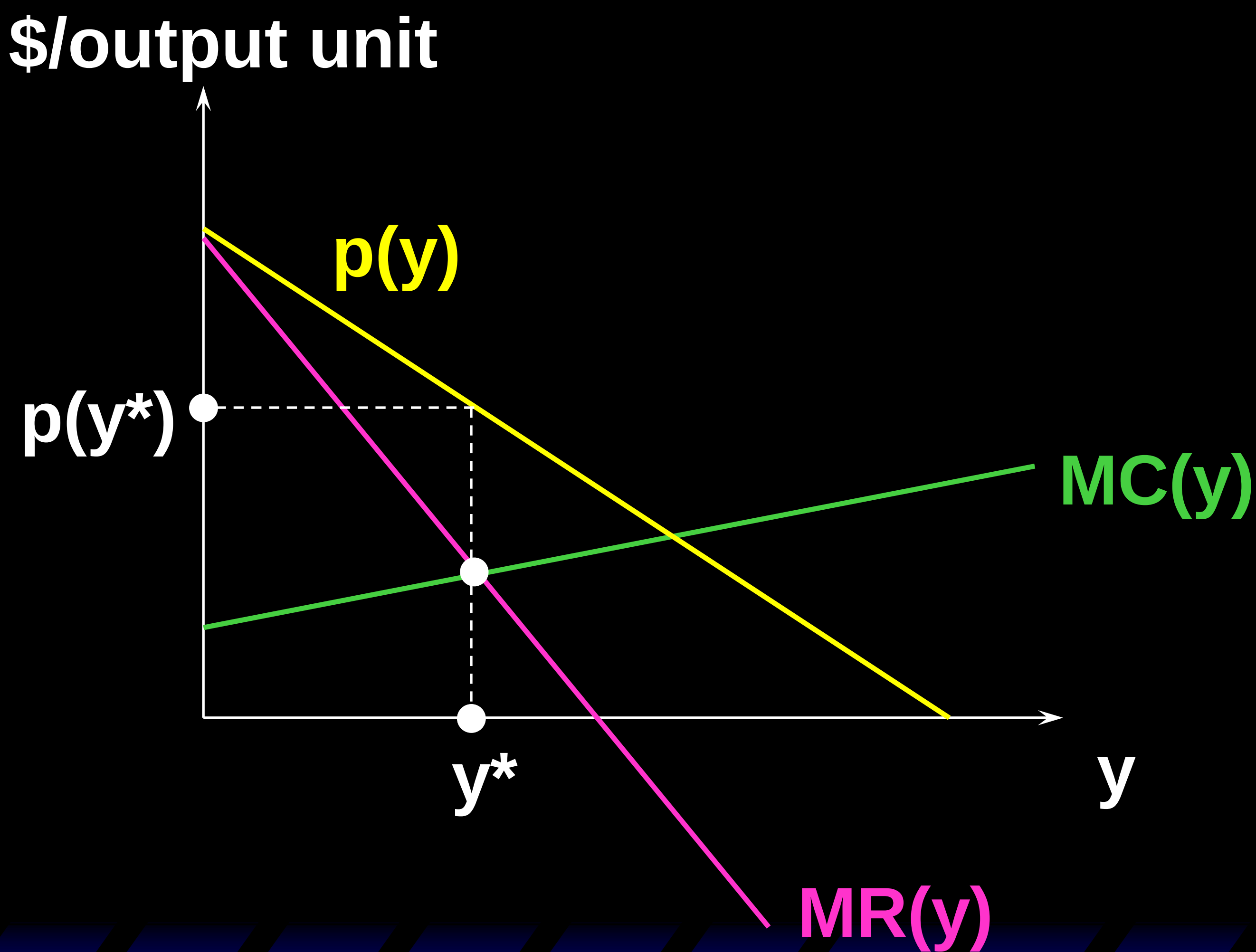


The Inefficiency of Monopoly

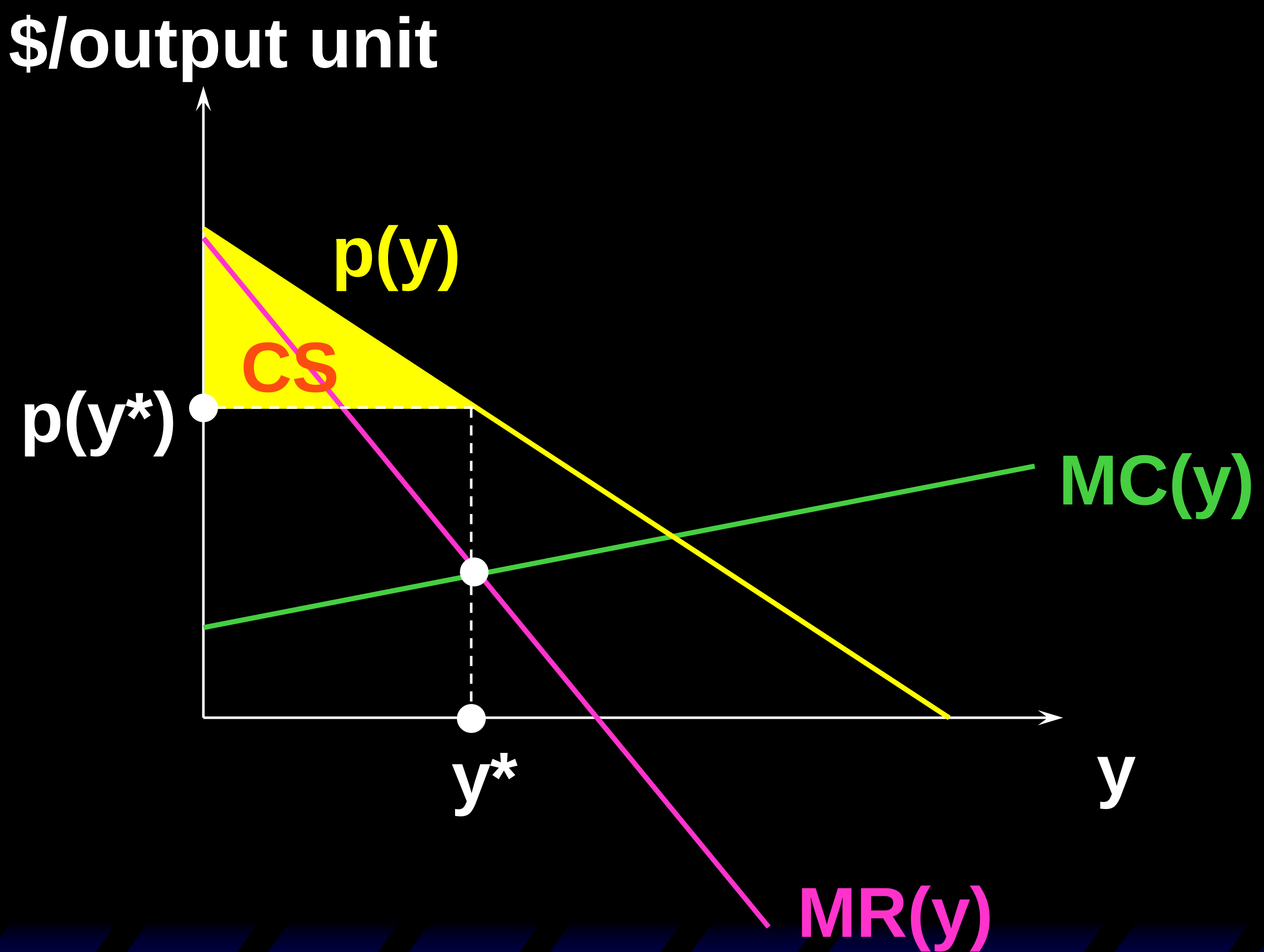


The efficient output level y^e satisfies p(y) = MC(y). Total gains from trade is maximized.

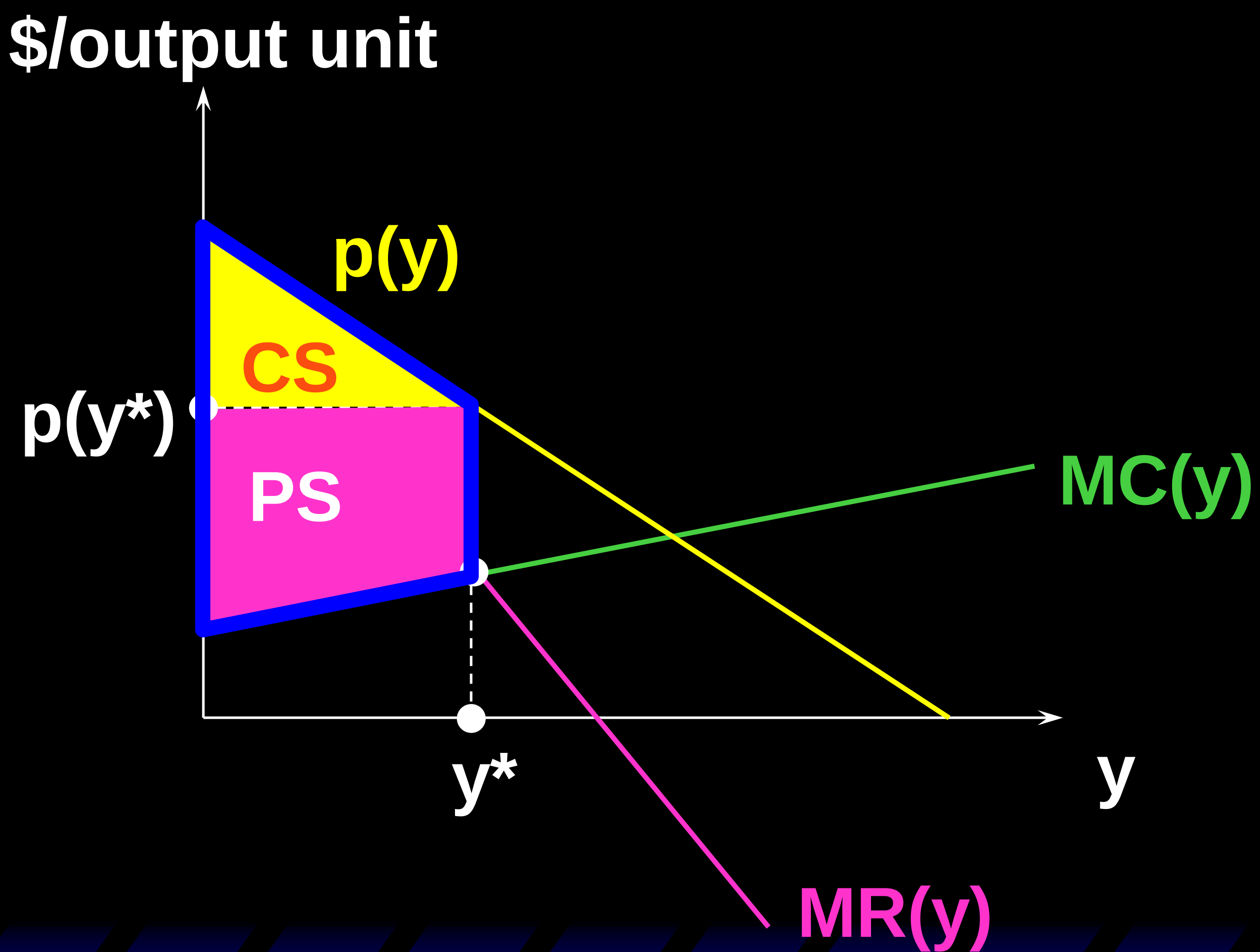
The Inefficiency of Monopoly



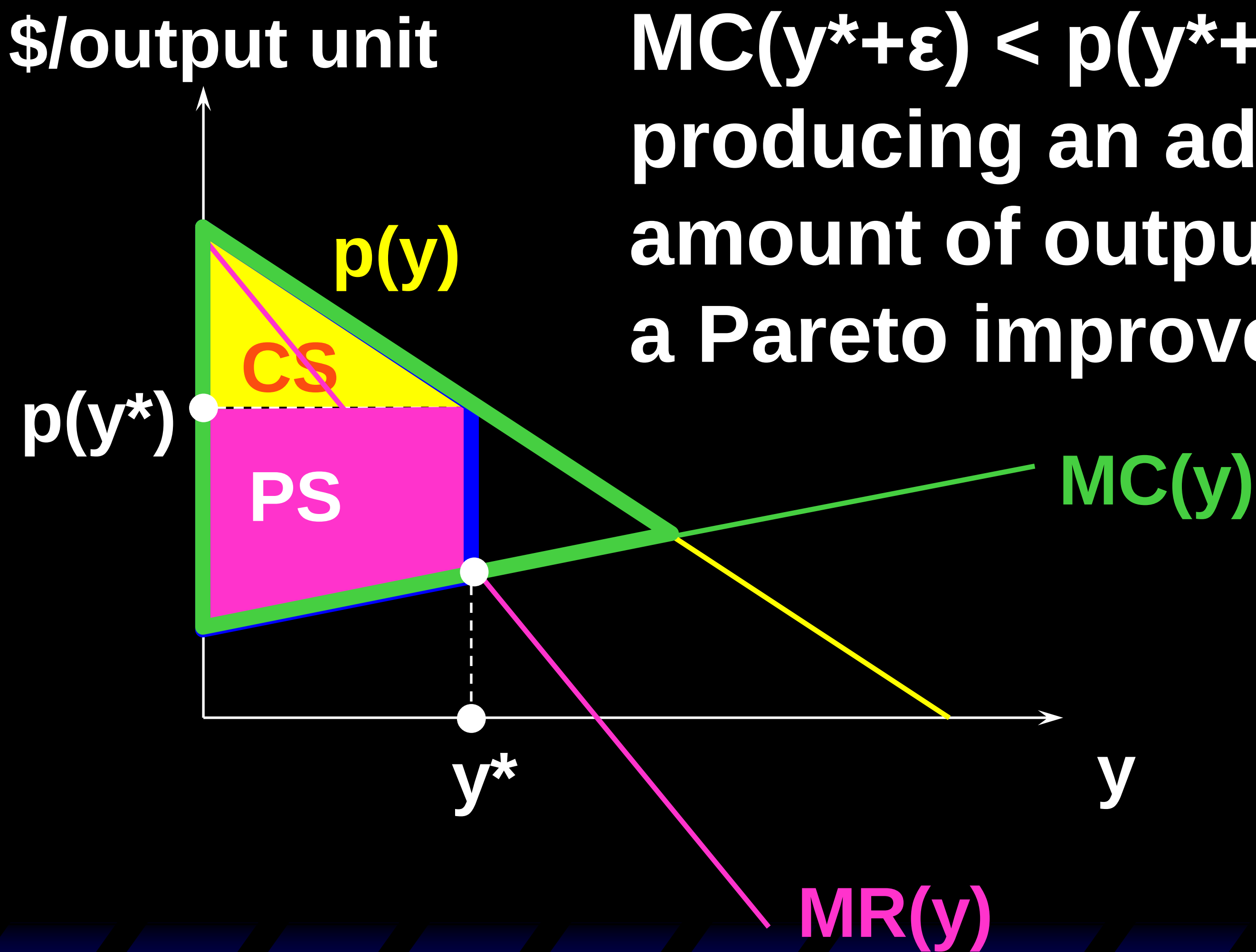
The Inefficiency of Monopoly



The Inefficiency of Monopoly

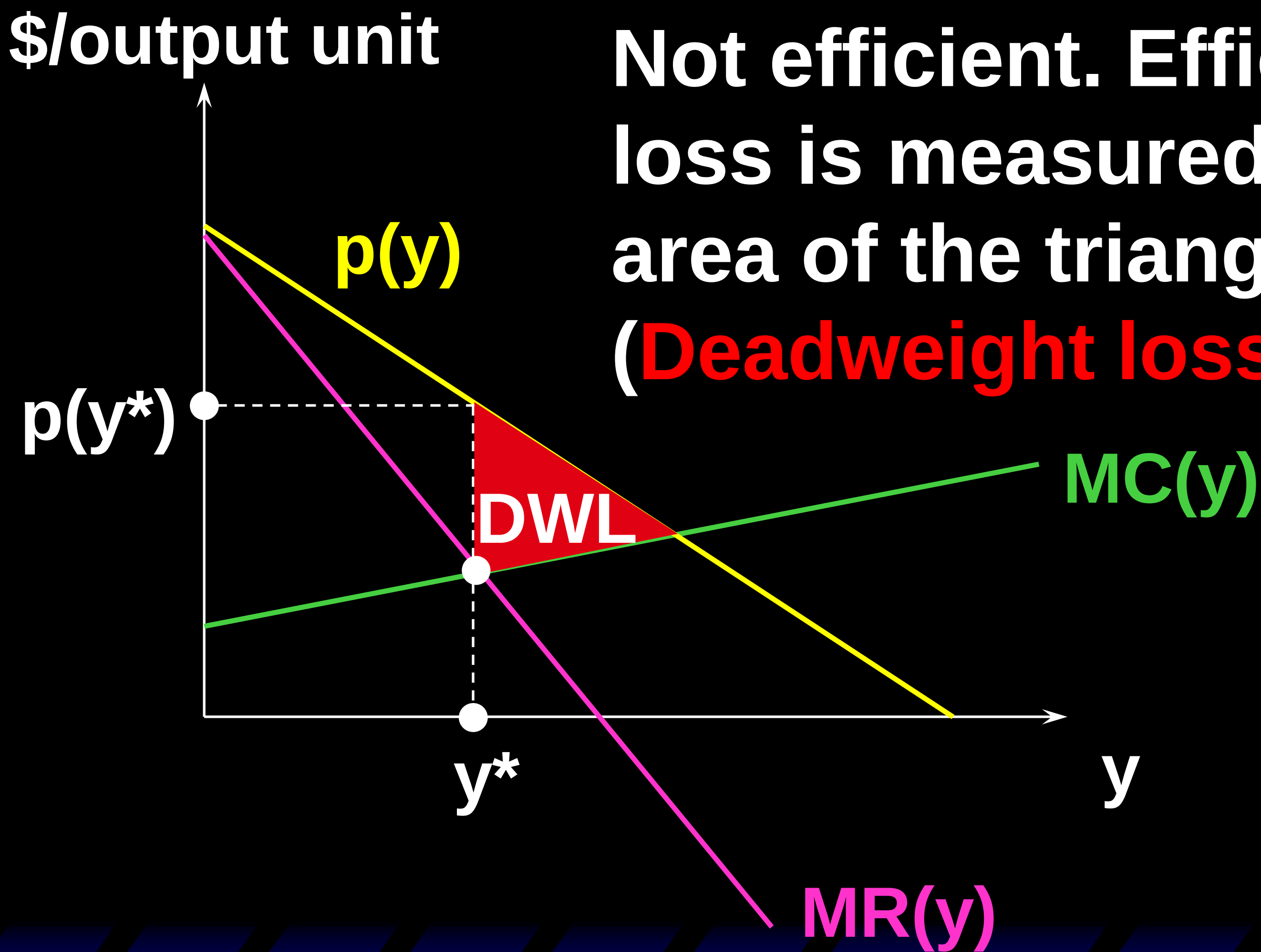


The Inefficiency of Monopoly



MC(y*+ε) < p(y*+ ε), so producing an additional ε amount of output will be a Pareto improvement.

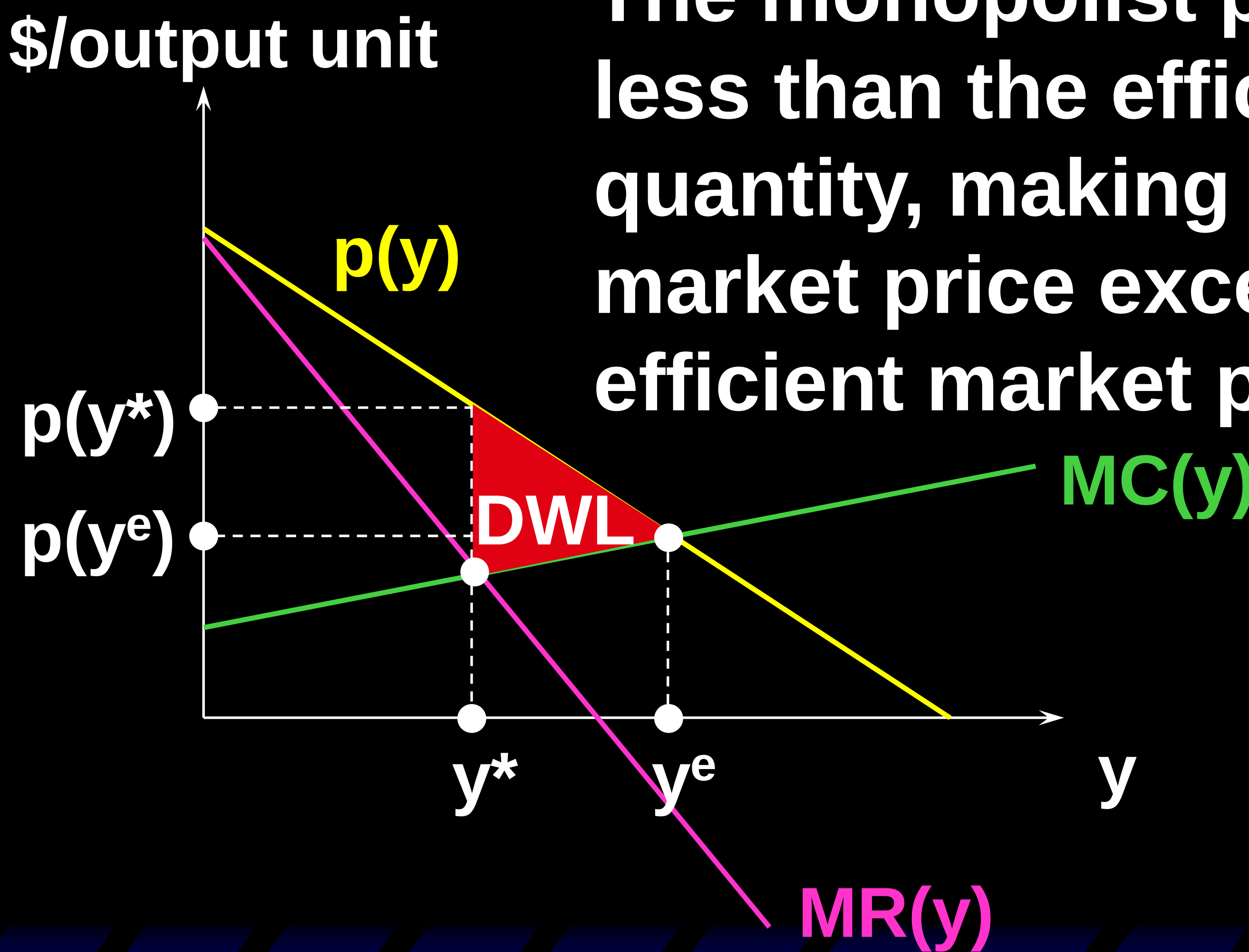
The Inefficiency of Monopoly



Not efficient. Efficiency loss is measured by the area of the triangle. (Deadweight loss)

The Inefficiency of Monopoly

The monopolist produces less than the efficient quantity, making the market price exceed the efficient market price.



Why Are There Monopolists?

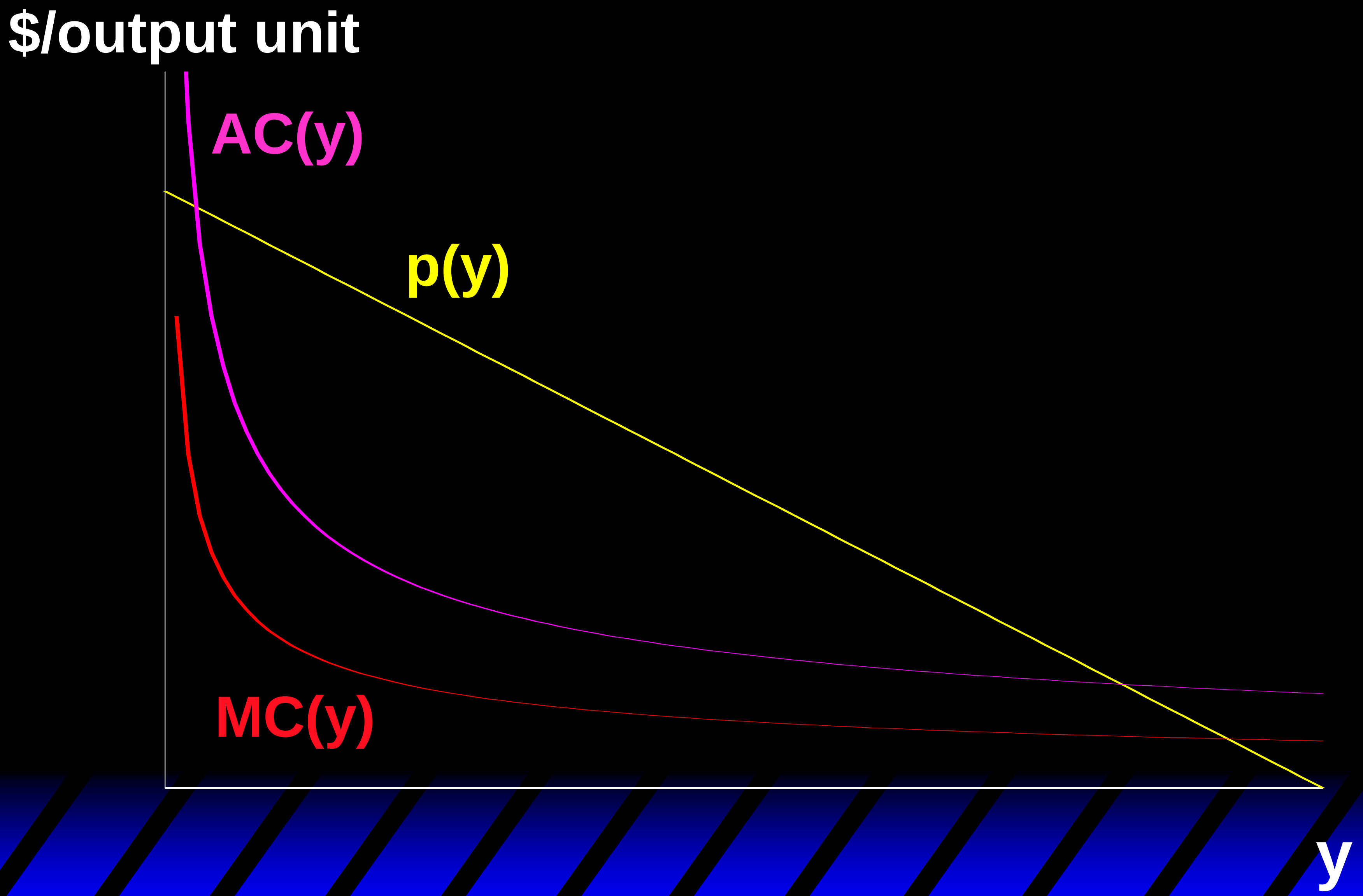
- **Product differentiation**
  - **Varian 26.8-10**

- **Entry barriers**
  - **patents, licenses, etc.**
  - **High quasi-fixed cost, or high marginal cost at the beginning (natural monopoly)**

Natural Monopoly

- A natural monopoly arises when the firm's technology has increasing returns to scale to some large extend s.t.
  - AC is decreasing within the range of market demand.
  - Or equivalently, MC < AC

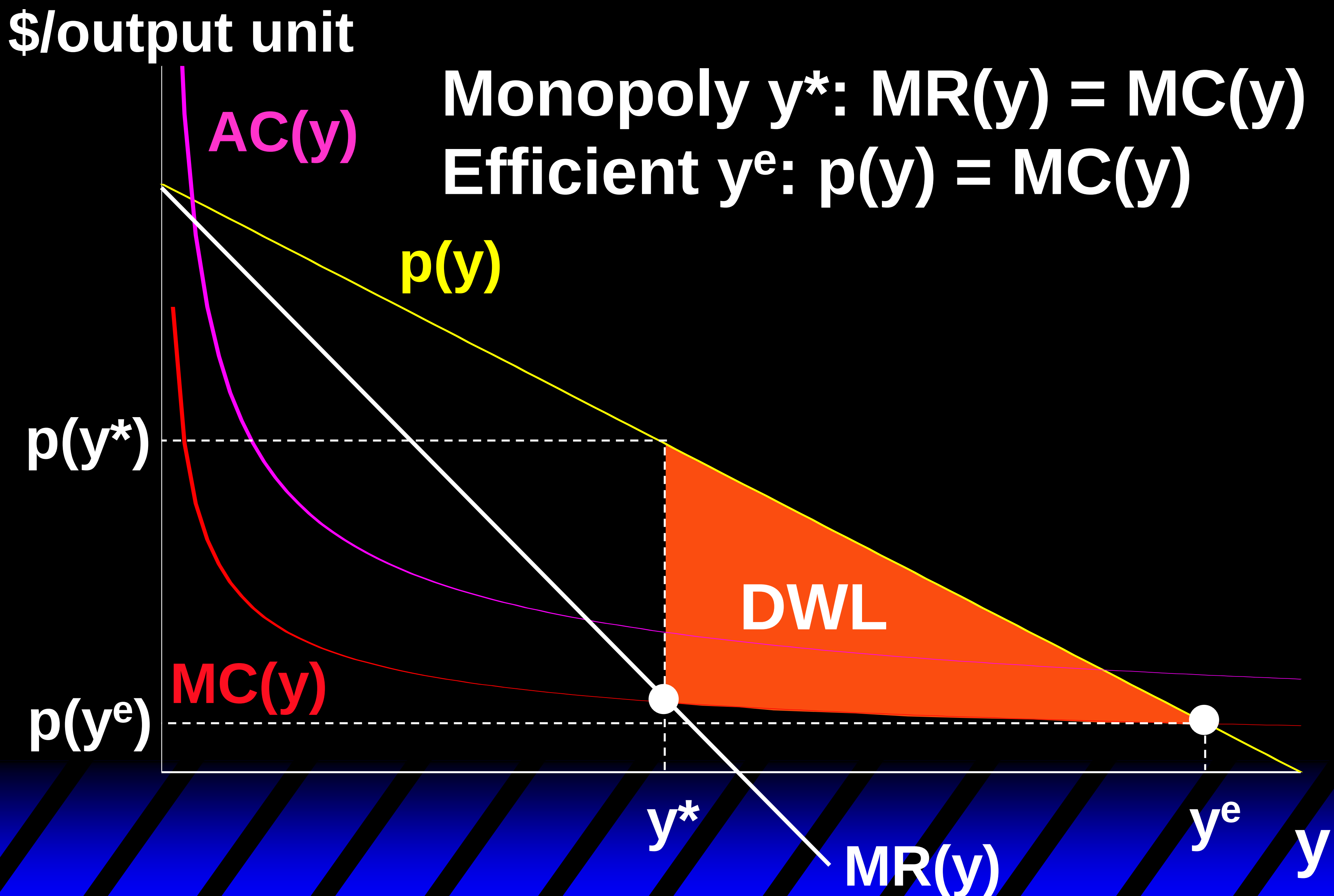
Natural Monopoly



Inefficiency of Natural Monopoly

Monopoly y*: MR(y) = MC(y)

Efficient y^e: p(y) = MC(y)

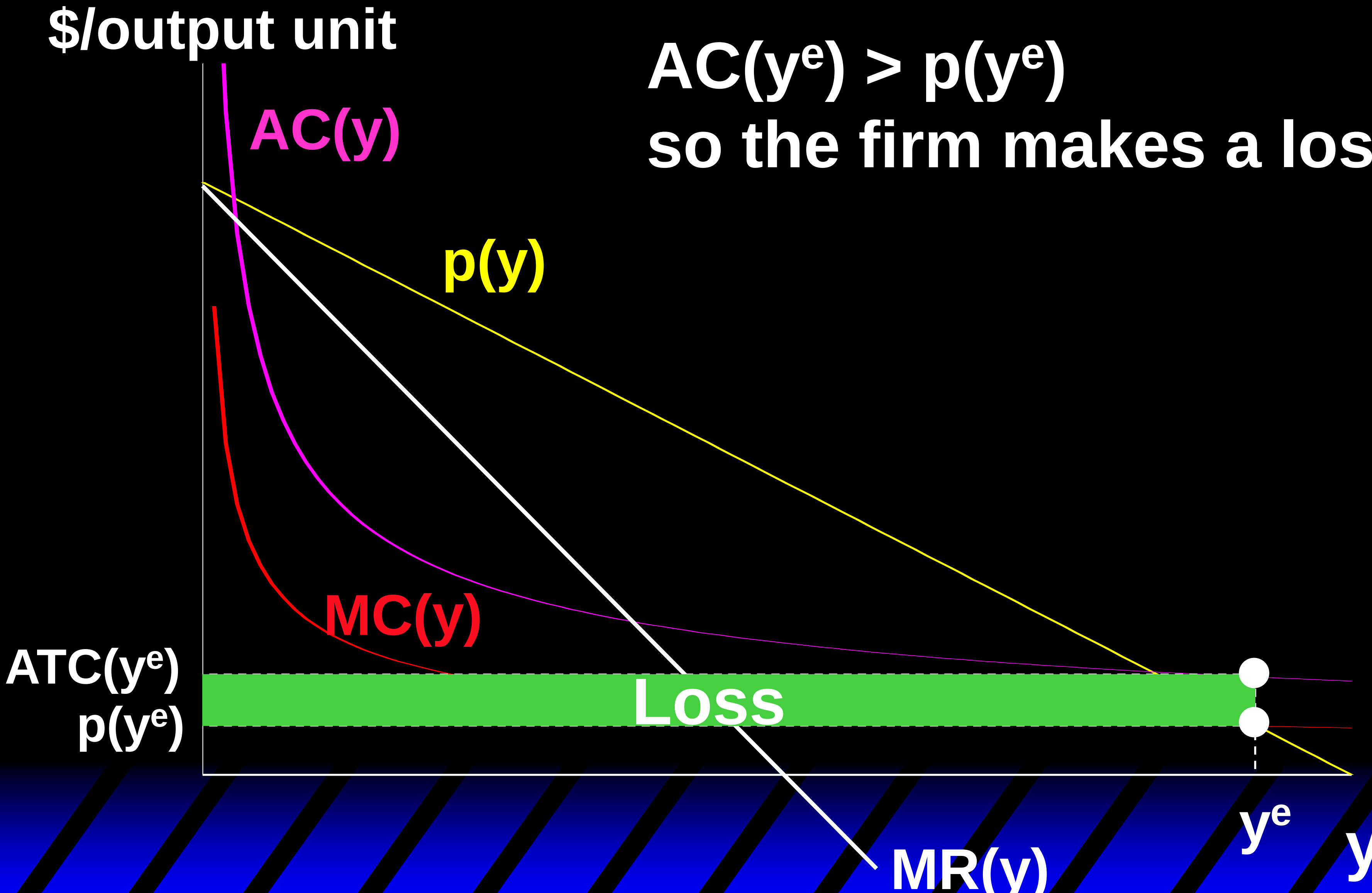


Regulating a Natural Monopolist

- What if the government require the monopolist to set $p = p^e$ to restore efficiency?

- The monopolist will get negative profit.
  - It will quit.

Regulating a Natural Monopoly



$AC(y^e) > p(y^e)$
so the firm makes a loss.