

Suppose a firm has cost  $c(y) = y^3$ . The firm is a price-taker.

A) Given the firm's cost function, do you think the firm has a decreasing, increasing, or constant returns to scale production function?

Decreasing returns to scale.

B) Write down the firm's profit function.

$$\pi(y) = py - y^3$$

C) What is the profit maximizing level of  $y$  for price  $p = 27$ ?

$$y = 3$$

D) What is the profit maximizing level of  $y$  for any price  $p$ ? That is, what is the firm's supply function?

$$y = \frac{\sqrt[3]{p}}{\sqrt[3]{3}}$$

E) What is this firm's price elasticity of supply?

$$\frac{\partial \left( \frac{\sqrt[3]{p}}{\sqrt[3]{3}} \right)}{\partial p} \frac{p}{\frac{\sqrt[3]{p}}{\sqrt[3]{3}}} = \frac{1}{2}$$

Suppose a firm has cost  $c(y) = 10y$ .

A) Given the firm's cost function, do you think the firm has a decreasing, increasing, or constant returns to scale production function?

Constant Returns to Scale

B) Write down the firm's profit function if it is a price taker.

$$\pi(y) = py - 10y$$

C) Below what price will this firm produce 0?

$$10$$

D) What will the firm do with price is above what you found in part C?

Try to produce as much as possible.

E) Suppose there are many such firms. Sketch the market inverse supply function.

Horizontal line at  $p = 10$

F) Suppose market demand is given by  $100 - p$ , sketch the inverse demand on the same graph.



G) What is the equilibrium price and quantity in this market?

$$p = 10, q = 90$$

H) Now suppose there is one monopolist that serves this market. Write down that firm's profit function.

$$\pi(q) = (100 - q)q - 10q$$

I) What is the quantity the monopolist will produce and what will they charge?

$$q = 45, p = 55$$

J) Calculate the dead weight loss when this market is served by a monopolist.

$$\frac{(100-45) \cdot 55}{2} = \frac{3025}{2}$$