

1. For a firm with the cost function $TC = 2Q^3 - 8Q^2 + 10Q + 28$, below what price will they shut down in the short run?

$$MC = AVC$$

$$MC = 6Q^2 - 16Q + 10$$

$$AVC = \frac{2Q^3 - 8Q^2 + 10Q}{Q} = 2Q^2 - 8Q + 10$$

$$6Q^2 - 16Q + 10 = 2Q^2 - 8Q + 10$$

$$Q = 2$$

$$P = MC = 6Q^2 - 16Q + 10$$

$$P = 6(2)^2 - 16(2) + 10 = 2$$

2. A firm has the cost function $C(Q) = 4Q^2 + 12Q + 36$. It operates in a perfectly competitive market.

- a.) At what price will this firm make exactly zero profit?

$$MC = ATC$$

$$MC = 8Q + 12$$

$$ATC = 4Q + 12 + \frac{36}{Q}$$

$$8Q + 12 = 4Q + 12 + \frac{36}{Q}$$

$$Q = 3$$

$$P = MC \Rightarrow 8 * 3 + 12 = 36 = P$$

- b.) What is the firm's profit maximizing quantity if price is \$40? How much profit does the firm make?

$$8Q + 12 = 40$$

$$Q = 3.5$$

$$\pi = TR - TC$$

$$\pi = P * Q - C(Q)$$

$$\pi = 40 * 3.5 - (4 * 3.5^2 + 12 * 3.5 + 36) = 140 - 49 - 42 - 36$$

$$\pi = 13$$

3. For the following marginal product of labor, what is the amount of labor the firm should hire if the wage rate is 10 and the output good is sold at a price of 20?

$$MP_L = 5L^{-0.5}$$

$$P * MP_L = w$$

$$20 * 5L^{-0.5} = 10$$

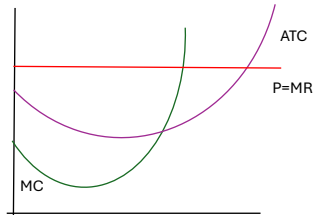
$$L^{-0.5} = \frac{10}{100}$$

$$L^{0.5} = 10$$

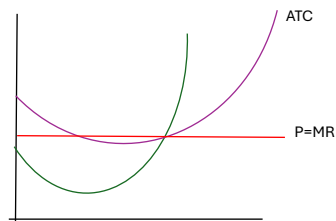
$$L = 100$$

4. For each of the following circumstances, draw an example of the associated graph. Make sure to include MC, P, MR, and ATC.

- a.) A firm makes positive profit.



- b.) A firm makes zero profit.



- c.) A firm makes negative profit.

