

Name V. 1
ID _____

Question 2 Suppose that market demand is given by $p = 16 - \sqrt{q+3}$. Answer the following question.

a. (3 points) For $q \geq 0$, is the demand function an increasing function?

$$\frac{dp}{dq} = -\frac{1}{2}(q+3)^{-\frac{1}{2}} < 0 \Rightarrow P \text{ is decreasing f}^n.$$

b. (3 points) For $q \geq 0$, is the demand function a concave or convex function?

$$\frac{d^2p}{dq^2} = \frac{d\left(-\frac{1}{2}(q+3)^{-\frac{1}{2}}\right)}{dq} = \frac{1}{4}(q+3)^{-\frac{3}{2}} > 0$$

$\rightarrow P$ is convex function.

c. (6 points) Calculate the elasticity of demand when $p = 10$.

$$p = 10 \Rightarrow \sqrt{q+3} + 16 = 10 \quad ; \quad \sqrt{q+3} = 6 \quad ; \quad q = 33.$$

$$\therefore \frac{dp}{dq} = -\frac{1}{2}(33+3)^{-\frac{1}{2}} = -\frac{1}{2} \cdot \frac{1}{6} = -\frac{1}{12}$$

$$\epsilon_d = \frac{dq}{dp} \cdot \frac{p}{q} = \left(\frac{1}{\frac{dp}{dq}}\right) \cdot \frac{p}{q} = \left(-\frac{1}{1/12}\right) \cdot \left(\frac{10}{33}\right) = -\frac{120}{33}$$

d. (3 points) Should the monopoly raise the price above \$10 if the monopolist wants to boost the total revenue?

$$|\epsilon_d| = \frac{120}{33} > 1 \rightarrow \text{Elastic demand.}$$

Thus $p \uparrow \rightarrow Q$ drops more than $P \uparrow \Rightarrow$ Revenue drops.

No, firm should lower the price instead.