

## 201-103-RE - Supplement E: Price Elasticity of Demand

- (1) The demand function for a product is given by  $p = \sqrt{600 - x}$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$17 decreases by 2%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (2) The demand function for a product is given by  $p = -x^2 - 39x + 8241$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$6551 increases by 3%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (3) The demand function for a product is given by  $p = 57 - \sqrt{x}$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$18 increases by 5%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (4) The demand function for a product is given by  $p = \frac{-0.05x + 120}{0.01x + 4}$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$3.75 decreases by 4%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (5) The demand function for a product is given by  $p = \sqrt{300 - x}$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$15 increases by 1%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (6) The demand function for a product is given by  $p = -x^2 - 21x + 12528$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$9986 decreases by 4%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?

- (7) The demand function for a product is given by  $p = 450 - 2.5\sqrt{x}$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$175 decreases by 3%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (8) The demand function for a product is given by  $p = \sqrt{100 - \sqrt{x}}$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$6 increases by 2%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (9) The demand function for a product is given by  $p = \frac{-0.1x + 80}{0.01x + 2}$  where  $p$  is the price per unit when  $x$  units are demanded.
- Determine the intervals on which the demand is elastic or inelastic.
  - If the price of the product at \$10 decreases by 3%, what is the approximate percentage change in demand?
  - If the change in (b) happens, will the total revenue increase or decrease?
  - What price will generate maximum revenue?
- (10) Suppose the demand curve for oPads is given by  $p = \frac{500 - x}{10}$ .
- Compute the elasticity of this demand function.
  - What is the price elasticity of demand when the price is \$30?
  - What is the percent change in the demand if the price is \$30 and increases by 4.5%?
- (11) Benson just opened a business selling calculators. The demand function for calculators can be given by  $x = 400 - 2p^2$ . Find the price for which he should sell the calculators in order to maximize revenue.
- (12) The demand for box seat tickets to watch the Habs can be described by the function  $p = \left(100 - \frac{x}{10}\right)^2$  where  $0 \leq x \leq 1000$ . Find the price elasticity of demand and determine whether management should increase or decrease the current ticket price of \$100 in order to increase revenue.
- (13) The current toll for the use of highway is \$250. Drivers use this highway because of its convenience even though there are other routes that are free. The provincial government does a study that determines that a toll of  $p$  dollars means  $x$  cars will use the road, where  $p = 2 \ln\left(\frac{x}{60000}\right)$ . Compute the elasticity  $\eta$  at  $p = 2.50$  and use it to determine whether an increase in the toll will increase or decrease revenue.
- (14) Currently 1800 people ride a commuter passenger ferry each day and pay \$4 for a ticket. The number of people  $x$  willing to ride the ferry at price  $p$  is determined by the relationship  $p = \left(\frac{3000 - x}{600}\right)^2$ . The company would like to increase its revenue. Use the price elasticity of demand to give advice to management on whether it should increase or decrease its price per passenger.
- (15) A cell phone supplier has determined that demand for its newest cell phone model is  $xp + 30p + 50x = 8500$ , where  $p$  is the price (in dollars per phone) at which the supplier will be able to sell  $x$  cell phones.
- Find the function that describes elasticity of demand for this product.
  - If the current price is \$150 per phone, will revenue increase or decrease if the price is lowered slightly?
  - What price should the cell phone supplier set for this cell phone to maximize its revenue from sales of the phone?

ANSWERS:

(1) (a) Elastic:  $[0, 400]$ ; Inelastic:  $(400, 600]$  (b) Increase 3.72% (c) Increase (d) \$14.14

(2) (a) Elastic:  $[0, 41]$ ; Inelastic:  $(41, 73]$  (b) Decrease 8.31% (c) Decrease (d) \$4961

(3) (a) Elastic:  $[0, 16044]$ ; Inelastic:  $(16044, 36100]$  (b) Decrease 4.62% (c) Increase (d) \$19

(4) (a) Elastic:  $[0, 658]$ ; Inelastic:  $(658, 2400]$  (b) Increase 2.29% (c) Decrease (d) \$8.23

(5) (a) Elastic:  $[0, 200]$ ; Inelastic:  $(200, 300]$  (b) Decrease 6% (c) Decrease (d) \$10

(6) (a) Elastic:  $[0, 58]$ ; Inelastic:  $(58, 101]$  (b) Increase 9.46% (c) Increase (d) \$7946

(7) (a) Elastic:  $[0, 14400]$ ; Inelastic:  $(14400, 32400]$  (b) Increase 3.82% (c) Increase (d) \$150

(8) (a) Elastic:  $[0, 6400]$ ; Inelastic:  $(6400, 10000]$  (b) Decrease 4.5% (c) Decrease (d) \$4.47

(9) (a) Elastic:  $[0, 247]$ ; Inelastic:  $(247, 800]$  (b) Increase 2.5% (c) Decrease (d) \$12.37

(10) (a)  $n = \frac{x}{x-500}$  (b) -1.5 (c) -6.75%

(11)  $\sim \$8.16$

(12)  $n(\$100) = -1/18$ ; increase price to increase revenue.

(13)  $n(\$2.5) = -1.25$ ; decrease price to increase revenue.

(14)  $n(1800) = -1/3$ ; increase price to increase revenue.

(15) (a)  $n = \frac{-d(x+30)}{x+d+50}$  (b)  $n(\$150) = -15/8$ ; decrease price to decrease revenue. (c) \$79.10

(16) Yes.

(17)  $n(\$30) = -4.5$ ; revenue will decrease if price is increased.

(18) (a) Increase. (b) \$150

- (16) A certain commodity satisfies the demand equation  $x = \frac{1000}{p^2}$ , relating price  $p$ , and quantity demanded,  $x$ . If the price of this commodity is lowered, will the revenue generated by its sales increase?
- (17) The price  $p$  (in dollars) and the demand  $x$  for a product are related by  $p^2 + 2x^2 = 1100$ . If the current price per unit is \$30, will revenue increase or decrease if the price is raised slightly?
- (18) Shark Inc. has determined that demand for its newest netbook model is  $\ln(x) - 2\ln(p) + 0.02p = 7$ , where  $p$  is the price (in dollars per netbook) at which Shark will be able to sell  $x$  netbooks. Shark has determined that this model is valid for prices  $p \geq 100$ .
- (a) If the current price is \$200 per unit, will revenue increase or decrease if the price is lowered slightly?
- (b) Find the price that maximizes the revenue from sales of this netbook model.