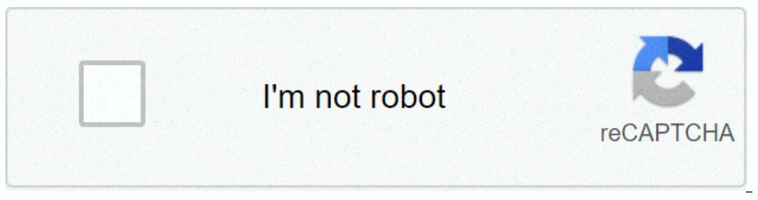

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How to find supply function from demand function

A supply function is a mathematical expression that represents the relationship between the units of quantity demanded of a product or service, its price and other deterministic factors such as input costs, prices of substitutes, etc. The dependent variable is the quantity supplied while the associated factors are independent. Supply Function in a Perfectly Competitive Market In a free market, the cost curves find the optimal production point. This is the point where costs are minimized and profits maximized. Individual firms' supply curves are positively sloped. Thus, an increase in price causes an increase in supply. In this case, the supplied quantity is dependent on the market prices while the price is dependent on the quantity available in the market. As the demand rises from D1 to D2, the quantity supplied rises from Q1 to Q2 and the price also rises from P1 to P2. Example of Supply Function in a Perfectly Competitive Market Assume that the supply function of a product is given by: \(Q_s=20+10P\) Where \(Q_s\)= quantity supplied, and \(P\)=Price Calculate the quantity suppplied if the price of the product is currently $10. Solution Using the function \(Q_s=20+10P\), substitute \(P=10\) so that the quantity supplied is: \(Q_s=20+10\times 10=120 \) units Supply Function under Monopoly Markets The supply function of a monopoly is purely based on the cost structure of the firm. However, it is important to note that a monopoly does not have a purely defined supply function. For a competitive firm: P = MR = MC. However, for a monopoly firm: P > MR = MC. Thus, the optimal output level and price are not determined by any supply curve. Here, the optimal output is based on the output levels that maximize profits. In a monopoly market, profit is maximized when marginal revenue is equal to marginal cost, i.e. MR=MC. Supply Function under Oligopoly Market The supply function of oligopolies is also not well defined. Therefore, the optimal points of an oligopoly cannot be determined without including demand conditions. The strategies of competitors need to be taken considered. However, the cost function is useful in determining the optimal supply level. In this case, it still holds that at the optimal points, MR = MC. If there exists a dominant firm, it becomes the price maker while the remaining firms are all price takers. Example of Supply Function in an Oligopoly Market Let: \(M\) = price maker \(T\) = price taker The price maker first identifies its profit-maximizing output \(MR_M = MC_M\) with an output \(Q_M\). Its price will depend on its portion of the total demand \(D_M\). When the price is \(P_M\), the price maker will supply \(Q_M\) of the total demand \(Q_T\). The price takers will, therefore, supply \(Q_T-Q_M = Q_F\). From the above, we can conclude that no single function can determine the quantity supplied. Supply Function for a Monopolistically Competitive Market In this market structure, the supply function is also not well defined. The appropriate output level is determined by the point where the Marginal Cost and Marginal Revenue curves intersect (MC=MR). However, it is important to note that the price will be charged in accordance with the demand schedule of the market. The supply curve of a firm should be able to measure the quantity that the firm is willing and able to supply at different price levels. Unfortunately, the marginal revenue and marginal cost do not include this information. Which forms of market structures has (have) a purely defined supply function? A. Perfect competition B. Perfect competition and monopolistic competition C. Perfect competition, monopolistic competition, and oligopoly Solution The correct answer is A. Only perfect competition has a defined supply function. Option B is incorrect. The supply curve of a firm under monopolistic competition should be able to measure the quantity that the firm is willing and able to supply at different price levels. Unfortunately, the marginal revenue and marginal cost do not include this information. Option C is incorrect. The supply function of oligopolies is also not well defined. Therefore, the optimal points of an oligopoly cannot be determined without including demand conditions. The strategies of competitors need to be taken considered. Reading 13 LOS 13c: Describe a firm's supply function under each market structure. Economics – Learning Sessions 1.The market supply function is P = 10 + Q and the market demand function is P = 70 - 2Q. Find consumer surplus when price= market-clearing price. Now, what would be the change in consumer surplus associated with a minimum floor price of $40? 2. Joe owns a small coffee shop, and his production function is q = 3KL where q is total output in cups per hour, K is the number of coffee machines (capital), and L is the number of employees hired per hour (labor). If Joe's capital is currently fixed at K= 4 machines, what is his short- run production function? 3. The slope of the total product curve (TP) is the 4. In Example 6.5 in the book, the authors use the observed production data from the U.S. carpet industry to show that small firms likely have constant returns to scale and that large firms likely have increasing returns to scale. Are returns to scale in this industry likely to continue increasing as these firms become even larger? 5. Assume that a firm's production process is subject to increasing returns to scale over a broad range of outputs. Long - run average costs over this output will tend to _____. 6. Ronny's Pizza House operates in the perfectly competitive local pizza market. If the price of cheese that goes into the making of a "cheese pizza" increases (ceteris paribus), what is the expected impact on Ronny's profit - maximizing output of "cheese pizzas" decision? 7. A perfectly competitive hardware manufacturer has total revenue of $85 million, total variable costs of $45 million, and fixed costs of $10 million. What is the firm's producer surplus? 8. When the market price is held above the competitive level, the deadweight loss is composed of _____. Students can download 12th Business Maths Chapter 3 Integral Calculus II Ex 3.3 Questions and Answers, Samacheer Kalvi 12th Business Maths Book Solutions Guide Pdf helps you to revise the complete Tamilnadu State Board New Syllabus and score more marks in your examinations. Tamilnadu Samacheer Kalvi 12th Business Maths Solutions Chapter 3 Integral Calculus II Ex 3.3 Question 1. Calculate consumer's surplus if the demand function p = 50 – 2x and x = 20 Solution: Given demand function p = 50 – 2x, x0 = 20 Hence the consumer's surplus is 400 units. Question 2. Calculate consumer's surplus if the demand function p = 122 – 5x – 2x2, and x = 6 Solution: Demand function p = 122 – 5x – 2x2 and x = 6 when x = x0 = 6 p0 = 122 – 5(6) – 2(36) = 122 – 30 – 72 = 20 Hence the consumer's surplus is 378 units Question 3. The demand function p = 85 – 5x and supply function p = 3x – 35. Calculate the equilibrium price and quantity demanded. Also, calculate consumer's surplus. Solution: Given pd = 85 – 5x and ps = 3x – 35 At equilibrium prices pd = ps 85 – 5x = 3x – 35 ⇒ 8x = 120 ⇒ x = 15 p0 = 85 – 5(15) = 85 – 75 = 10 The equilibrium price is ₹10, the quantity demanded is 15. The consumer surplus is 562.50 units. Question 4. The demand function for a commodity is p = e-x .Find the consumer's surplus when p = 0.5. Solution: Given demand function p = e-x At p = 0.5, (i.e) p0 = 0.5, we have p0 = \(e^{-x_{0}}\) ⇒ 0.5 = \(e^{-x_{0}}\) Taking loge on both sides loge(0.5) = -x0 Question 5. Calculate the producer's surplus at x = 5 for the supply function p = 7 + x. Solution: Given supply function is p = 7 + x, x0 = 5 p0 = 7 + x0 = 7 + 5 = 12 Producer's surplus Hence the producer's surplus is \(\frac{25}{2}\) units Question 6. If the supply function for a product is p = 3x + 5x2. Find the producer's surplus when x = 4. Solution: Given the supply function ps = 3x + 5x2 when x = 4, (i.e) x0 = 4, p0 = 3 (4) + 5(4)2 = 12 + 80 = 92 Hence the producer's surplus is 237.3 units. Question 7. The demand function for a commodity is p = \(\frac{36}{x+4}\). Find the consumer's surplus when the prevailing market price is ₹ 6. Solution: Given p = \(\frac{36}{x+4}\) The marker price is ₹6 (i.e) p0 = 6 So the consumer's surplus when the prevailing market price is ₹ 6 is (36 log \(\frac{3}{2}\) – 12) units. Question 8. The demand and supply functions under perfect competition are pd = 1600 – x2 and ps = 2x2 + 400 respectively. Find the producer's surplus. Solution: Given demand function pd = 1600 – x2 and Supply function ps = 2x2 + 400 Perfect competition means there is equilibrium between supply and demand ps = pd ⇒ 1600 – x2 = 2x2 + 400 ⇒ 3x2 = 1200 ⇒ x2 = 400 ⇒ x = ± 20 The value of x cannot be negative. So x = 20 we take x0 = 20. p0 = 1600 – (20)2 = 1600 – 400 = 1200 Hence the producer's surplus is \(\frac{32000}{3}\) units. Question 9. Under perfect competition for a commodity the demand and supply laws are \(p_{d}=\frac{8}{x+1}-2\) and \(p_{s}=\frac{x+3}{2}\) respectively. Find the consumer's and producer's surplus. Solution: Given \(p_{d}=\frac{8}{x+1}-2\) and \(p_{s}=\frac{x+3}{2}\) Here, since there is perfect competition, there is equilibrium, that is pd = ps Since the value of x cannot be negative, x = 1 we take this value as x0 Hence under perfect competition, (i) The consumer's surplus is (8 log 2-4) units (ii) The producer's surplus is \(\frac{1}{4}\) units. Question 10. The demand equation for a products is x = \(\sqrt{100-p}\) and the supply equation is x = \(\frac{p}{2}\) – 10. Determine the consumer's surplus and producer's surplus, under market equilibrium. Solution: Given demand equation is x = \(\sqrt{100-p}\) and supply equation is x = \(\frac{p}{2}\) – 10 So the demand law is x2 = 100 – p ⇒ pd = 100 – x2 Supply law is given by x + 10 = \(\frac{p}{2}\) ⇒ ps = 2(x + 10) Under equilibrium pd = ps ⇒ 100 – x2 = 2(x + 10) ⇒ 100 – x2 = 2x + 20 ⇒ x2 + 2x – 80 = 0 ⇒ (x + 10) (x – 8) = 0 ⇒ x = -10, 8 The value of x cannot be negative, So x = 8 When x0 = 8, p0 = 100 – 82 = 100 – 64 = 36 = 288 – 2(112) = 64 So the producer's surplus is 64 units. Question 11. Find the consumer's surplus and producer's surplus for the demand function pd = 25 – 3x and supply function ps = 5 + 2x. Solution: Given pd = 25 – 3x and ps = 5 + 2x At market equilibrium, pd = pss ⇒ 25 – 3x = 5 + 2x ⇒ 5x = 20 ⇒ x = 4 When x0 = 4, p0 = 25 – 12 = 13 So the consumer's surplus is 24 units. So the producer's surplus is 16 units.