

PARTIAL CREDIT WILL ONLY BE GIVEN IF YOU SHOW ALL OF YOUR WORK.

1. Jane consumes only two goods: popcorn and soda. Bundle W includes 5 bags of popcorn and 2 sodas. Bundle F includes 3 bags of popcorn and 6 sodas. Bundle V includes 4 bags of popcorn and 1 soda. Jane prefers bundle F to bundle W.

- a) Which bundle will she prefer? Bundle W or bundle V? Which axiom do you use to answer this question? (6 points)

$$\underset{F}{(3,6)} > \underset{W}{(5,2)} > \underset{V}{(4,1)} \quad W > V \text{ by nonsatiation}$$

- b) Which bundle will she prefer? Bundle F or bundle V? Which axiom do you use to answer this question? (6 points)

$$F > V \text{ by transitivity}$$

2. Justin likes doing two things: watching TV shows and playing hockey. He doesn't spend any time doing anything else. Yesterday, Justin spent 10 hours watching TV and 14 hours playing hockey. His utility function is $U(T,H) = T^2 + H$ where T denotes the number of hours spent watching TV and H denotes the number of hours spent playing hockey.

- a) What is a *feasible* combination of TV and hockey that will make Justin even happier than he is when he watches 10 hours of TV and plays 14 hours of hockey? (4 points)

$$U(10,14) = 100 + 14 = 114 \quad \text{find } T, H \text{ such that}$$

$$U(T,H) > 114 \text{ but } T + H = 24$$

$$T=11 \quad H=13 \rightarrow U(11,13) = 121 + 13 = 134$$

- b) What is Justin's budget constraint? (4 points)

$$T + H = 24$$

- c) Calculate Justin's MRS when he consumes 10 hours of TV and 14 hours of hockey. (4 points)

$$\frac{\partial U / \partial T}{\partial U / \partial H} = \frac{2T}{1} = 20$$

3. Jeremy's preferences for good X and good Y can be summarized with the following utility function: $U(x,y) = (2X+2)(Y+1)$. Jeremy has \$161 to spend on X and Y. X costs \$1 per unit and Y costs \$2 per unit.

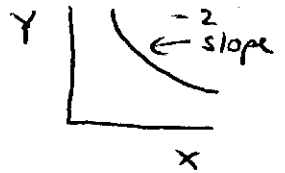
- a) Write down an expression describing Jeremy's marginal rate of substitution between X and Y. (5 points)

$$U = 2XY + 2Y + 2X + 2$$

$$MRS = \frac{-\partial U / \partial X}{\partial U / \partial Y} = \frac{-(2Y+2)}{(2X+2)} = -\frac{Y+1}{X+1}$$

- b) When Jeremy has 9 units of X and 19 units of Y, how many units of X is he willing to trade in for another unit of Y? (5 points)

$$MRS = -\frac{20}{10} = -2$$



so he is willing to give up 1/2 unit of X for another Y.

- c) Given Jeremy's constraints, how much X and Y will he choose to consume? (10 points)

$$MRS = -\frac{P_x}{P_y}$$

$$\frac{Y+1}{X+1} = \frac{1}{2} \Rightarrow \begin{aligned} 2Y+2 &= X+1 \\ 2Y+1 &= X \end{aligned}$$

$$161 = X + 2Y = 2Y+1 + 2Y$$

$$160 = 4Y$$

$$\boxed{40 = Y \quad X = 81}$$

4. Bob's demand curve for milkshakes is $X = -3P_x^3 + P_y + 2$, where X is the number of milkshakes he consumes and Y is another good.

a) Is Y a substitute for milkshakes or a complement? Why? (3 points)

Assuming Y not Giffen, $P_y \uparrow \Rightarrow \downarrow y$. From EQ we see that $\uparrow P_y \Rightarrow \uparrow X$ so $\uparrow y \uparrow \downarrow X$ means substitutes.

b) Use calculus to write an equation that describes the price elasticity of demand for good X. (5 points)

$$\frac{dX}{dP_x} \cdot \frac{P_x}{X} = -9P_x^2 \cdot \frac{P_x}{X} = -\frac{9P_x^3}{X}$$

c) When milkshakes cost \$1 a piece and Bob consumes 4 of them, what is his price elasticity of demand for milkshakes? Is his demand for x elastic, inelastic or unit elastic? (5 points)

$$-\frac{9(1)}{4} = -\frac{9}{4} \quad \text{elastic}$$

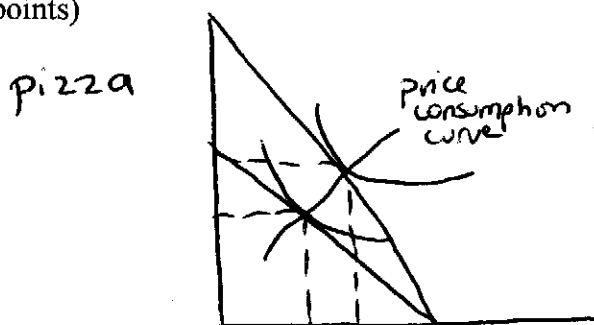
d) Based on your answer to c) what will happen to the revenues of a milkshake stand if it raises the price of milkshakes from \$1 to \$2? Why? (5 points)

$|\% \Delta Q| > |\% \Delta P|$ since elastic.

So revenues will fall.

(since quantity of milkshakes falls alot)

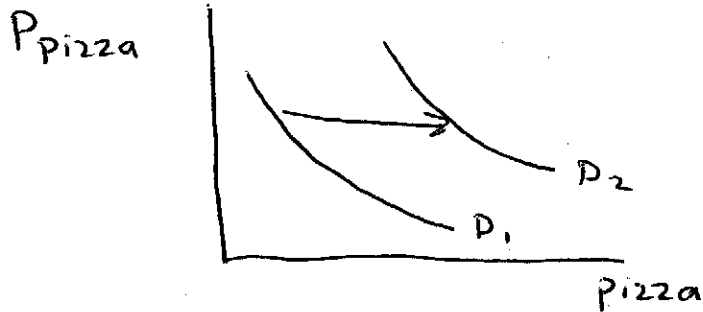
5. a) Are the two goods on the diagram below complements or substitutes? Why? (5 points)



Complements. When the price of pizza falls, the consumption of both goods rises.

movies

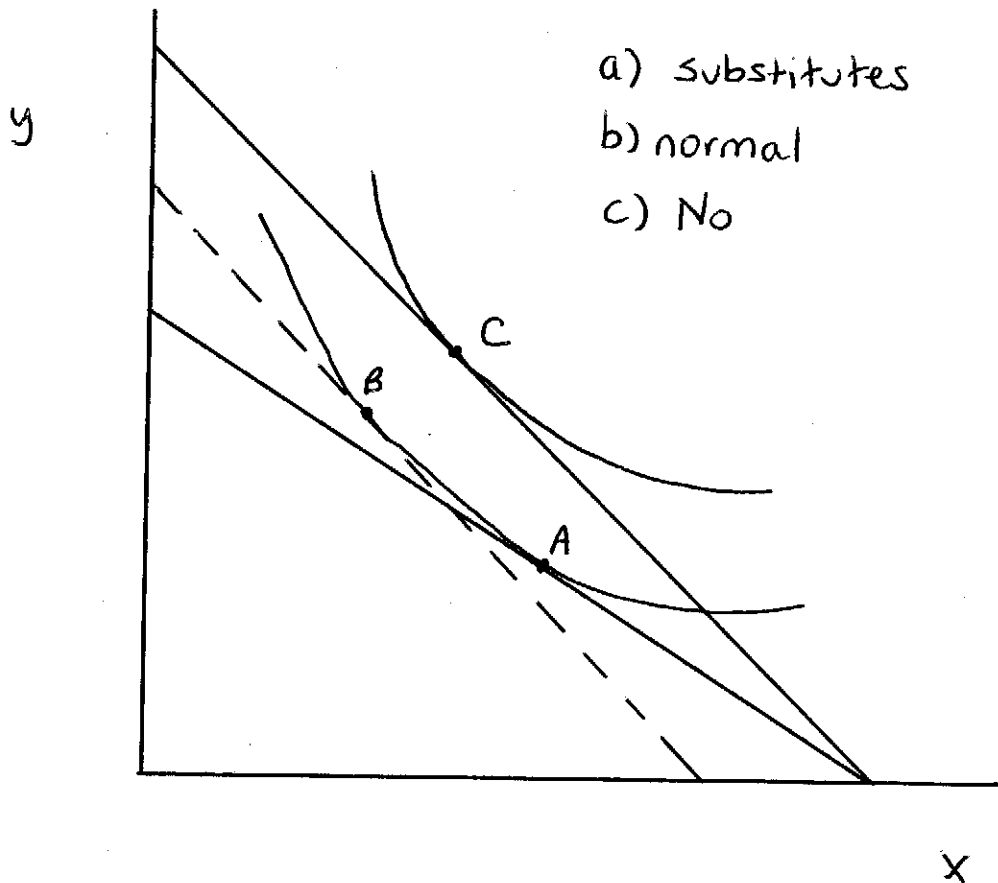
- b) Based on your answer to a), what will happen to the demand curve for pizzas when the price of movies falls? Show below. (3 points)



- c) On the diagram in part a) draw the price consumption curve and label it. (3 points)

6. Use the diagram below to answer the following questions.

- a) Are X and Y complements or substitutes? (3 points)
 b) Is Y a normal good or an inferior good? (3 points)
 c) Is Y a Giffen good? (5 points)



7. Use the diagram below to answer the following questions. Note that $p_x=1$.

a) How much income does this consumer have? (4 points)

\$50

b) Circle **all** of the following words that describe the relationship between the two goods: (4 points—you lose 2 points for each wrong choice here)

Complements, substitutes, perfect complements, unit elastic, perfect substitutes, no relationship.

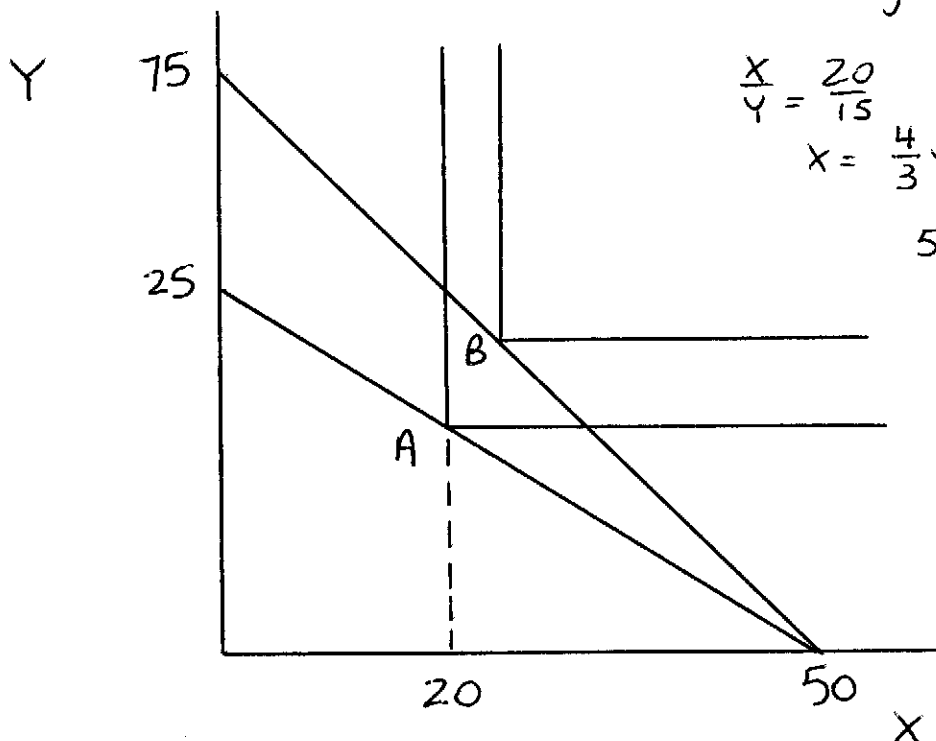
c) If the consumer chooses bundle A, what is the price of Y? (4 points)

\$2

d) If the consumer chooses bundle A, how much Y does he consume? (4 points)

15

e) If the consumer chooses bundle B, how much X and how much Y does he choose? (10 points)



$$p_x = 1 \quad p_y = \frac{2}{3} \quad I = 50$$

$$\frac{X}{Y} = \frac{20}{15}$$

$$X = \frac{4}{3} Y \quad Y = \frac{3}{4} X$$

$$50 = X + \frac{2}{3} \left(\frac{3}{4} X \right)$$

$$50 = 1.5 X$$

~~X = 33.33~~
 $X = 33.33$

$$Y = \frac{3}{4} (33.33) = 25$$

check
 $33.33 + \frac{2}{3} (25) \approx 50$