3. The table provided shows the marginal utility for Lucy when she consumes Good X and Good Y.

Quantity of Good X	Marginal Utility of Good X (utils)	Quantity of Good Y	Marginal Utility of Good Y (utils)
1	20	1	28
2	16	2	24
3	12	3	16
4	8	4	8
5	4	5	–4
6	–2	6	–8

A. If Good X and Good Y are free, how many units of each good will maximize Lucy's total utility?

B. Calculate Lucy's total utility if she consumes 2 units of Good X and 2 units of Good Y. Show your work.

C. Suppose instead that the price of each unit of Good X is \$2 and the price of each unit of Good Y is \$4. Lucy has a budget of \$20 to spend on the two goods.

i. If Lucy purchases 2 units of Good X, what is the maximum quantity of Good Y Lucy can purchase?

ii. What is Lucy's optimal combination of Good X and Good Y? Explain your answer using marginal analysis and numbers.

D. Suppose the price elasticity of demand for Good X is -2.0, the price elasticity of demand for Good Y is -0.8, and the cross-price elasticity of demand between Good X and Good Y is $+1.6$. Are goods X and Y complementary goods, substitute goods, normal goods, or inferior goods? Explain.

STOP

END OF EXAM

Question 3: Short — 5 points

A Point 1	State that Lucy will maximize her total utility by consuming 5 units of Good X and 4 units of Good Y.	**1 point**
B Point 2	Calculate Lucy's total utility of consuming 2 units of Good X and 2 units of Good Y as 88 utils and show your work. $\text{Total Utility from consuming 2 units of Good X} = 20 \text{ utils} + 16 \text{ utils} = 36 \text{ utils}$ $\text{Total Utility from consuming 2 units of Good Y} = 28 \text{ utils} + 24 \text{ utils} = 52 \text{ utils}$ $\text{Total Utility from consuming 2 units of Good X and 2 units of Good Y} = 36 \text{ utils} + 52 \text{ utils} = 88 \text{ utils}$	**1 point**
C (i) Point 3	State that Lucy can purchase a maximum of 4 units of Good Y.	**1 point**
(ii) Point 4	State that Lucy's optimal consumption is 4 units of Good X and 3 units of Good Y and explain that at this combination, the marginal utility per dollar spent on the last unit of Good X is 4 utils/$ (= 8 utils/$2), and the marginal utility per dollar spent on the last unit of Good Y is 4 utils/$ (= 16 utils/$4) when Lucy spends her entire budget of $20 (= $2 × 4 units of Good X + $4 × 3 units of Good Y).	**1 point**
D Point 5	State that goods X and Y are substitute goods and explain that the cross-price elasticity of demand between Good X and Good Y is positive. A positive cross-price elasticity indicates that an increase (a decrease) in the price of Good X will increase (decrease) the demand; therefore, the quantity demanded of a substitute good, Good Y.	**1 point**