1. Suppose we have the utility function,

\[ U = x^3 y^3. \]

(a) Find the function for the marginal rate of substitution.
(b) Show that this utility function satisfies the first 3 axioms of consumer preference.

2. Suppose we have the utility function,

\[ U = xy + x + y. \]

(a) Find the function for the marginal rate of substitution.
(b) If prices are \( p_x = \$2 \) and \( p_y = \$4 \), and if income is \( M = \$18 \), find the utility maximizing consumption bundle.

3. Suppose we have the utility function,

\[ U = xy. \]

(a) Derive the generalized demand function for \( x \) as a function of \( p_x, p_y, \) and \( M \).
(b) Are the own-price ordinary demand functions downward sloping? Explain.
(c) Is good \( x \) normal or inferior? Explain.

4. Suppose there are 100 consumers, each with an income of \$900 and utility function

\[ U = x^2 y. \]

Suppose that the price of good \( y \) is \$4. Derive the own-price market demand function for \( x \).

Hint: First derive the demand function for one consumer. Since there are 100 identical consumers, the total market demand is 100 times what one consumer would demand.