Multiple Choice: (circle the letter of the best response; 4 points each)

1) Chad’s preferences over beer and pretzels are “monotonic,” “transitive,” and “convex.” If he is indifferent between $A = (6,10)$ and $B = (2,20)$ (that is, $A \sim B$), then
   e. More than one, but not all, of the above answers is correct.

2) Which of the following inequalities describes the “competitive budget set” (or “set of affordable bundles”) for a consumer?
   b. $p_1x_1 + p_2x_2 \leq I$.

3) As the price of pizza decreases from $15 to $12 per pie, Brad’s Compensating Variation (in income) is $CV = 21.12$ and his Equivalent Variation (in income) is $EV = 23.60$. From this information alone, we can infer that
   b. pizza is a normal good for Brad.

4) Consider the market for lemons. Suppose demand in this market were to increase, with no change in supply. This change would result in
   a. an increase in both equilibrium price and equilibrium quantity.

5) The value of Indirect Utility should
   e. All of the above answers are correct.

6) The Income Elasticity of Demand for Eggs is $\varepsilon_{I,\text{Eggs}} = 0.44$; the Income Elasticity of Demand for Margarine is $\varepsilon_{I,\text{M}} = -0.20$. From this information alone, we can infer
   c. Eggs are a normal good.

7) Jim’s marginal utility for beer
   a. provides a measure of how his utility changes as he consumes more beer (with consumption of all other goods fixed).

8) Consider a market in which demand is given by the function $D(p) = 100 - 2p$ and supply is given by the function $S(p) = 3p$. In equilibrium
   e. More than one of the above answers is correct.

9) The “Income Consumption Curve” directly illustrates
   c. the utility maximizing combinations of commodity one and commodity two as income is varied, all other factors fixed.

10) When the price of Pork decreases from $\bar{p} = 4.25$ to $\hat{p} = 3.85$ Joe’s monthly consumption increases from $\bar{q} = 5$ to $\hat{q} = 7$. When decomposing this change into a Substitution Effect and an Income Effect, we see that the Substitution Effect results in a 3 unit increase in his consumption of Pork. From this information, we know that
    a. Pork is an Inferior good for Joe.
11) Which of the following is NOT one of the “three basic analytical tools” (or “three key analytical tools”) upon which nearly all microeconomic analysis relies?
   b. Indirect Utility.

12) Consumers’ Surplus can be graphically described as
   d. the area below the demand curve, but above price, over all units traded.

13) Thomas has income of $360, which he uses to purchase $x_1 = (CDs)$ and $x_2 = (DVDs)$. Initially, each CD costs $p_1 = $12 and each DVD costs $p_2 = $20. If the price of a CD increases to $p_1 = $15, then his budget line (drawn with $x_1$ on the horizontal axis)
   c. will become steeper, with the vertical intercept remaining the same.

14) An Endogenous Variable
   b. is one whose value is determined within the economic system being studied.

15) In a “Constrained Optimization Problem,” the “Objective Function” refers to
   b. the relationship that the decision maker wants to maximize or minimize.

16) The price elasticity of demand for Airline Travel is $\varepsilon_{q,p} = -1.52$. Based upon this value
   c. a slight increase in price would decrease total consumer expenditures on Airline Travel.

17) Jason likes both $x_1 = (peanut butter)$ and $x_2 = (grape jelly)$. He always gets the same additional satisfaction from “2 more ounces of peanut butter” as he does from “one more ounce of grape jelly.” Which of the following utility functions is consistent with this description of his preferences?
   a. $U(x_1, x_2) = x_1 + 2x_2$.

18) The production process described by the production function $F(L, K) = 4L^{.74}K^{.68}$
   a. exhibits Increasing Returns to Scale.

19) $MRTS_{L,K}$ (that is, the “Marginal Rate of Technical Substitution (of labor for capital)”) 
   c. provides a measure of the rate at which the firm is able to substitute labor for capital, while maintaining a constant level of output.

20) In the Long Run
   c. the firm can vary the amount hired of all inputs.
"Short Answer" Questions:

1. Consider a firm with the production function \( q = F(L, K) \). The "\( q = 500 \) isoquant," the "\( q = 650 \) isoquant," and a single isocost line are illustrated below. Assume throughout that the per unit price of Capital is \( r = 100 \).

   ![Graph showing production function with isoquants and isocost line]

   a. What is the per unit price of Labor? Explain. (2 points)

   *In general, the slope of any isocost line is equal to \(-\frac{w}{r}\). The isocost line illustrated above has a slope of \(-\frac{80}{400} = -\frac{1}{5}\). Since \( r = 100 \), it follows that \( \frac{w}{100} = \frac{1}{5} \). From here, we see that \( w = \frac{100}{5} = 20 \).*

   b. If the firm is operating in the Long Run and wants to produce \( q = 500 \) units of output, could \((L, K) = (150,50)\) be the solution to the firm’s Cost Minimization Problem? Explain. (4 points)

   *In the Long Run the firm is able to vary both the level of labor and the level of capital. As a result, in order to minimize production costs, they will want to operate where \( MRTS_{L,K} = \frac{w}{r} \). At such a point, the slope of the isoquant will be equal to the slope of the isocost line. This is clearly not the case for \((L, K) = (150,50)\), implying that this input combination cannot be the solution to the firm’s Cost Minimization Problem in the Long Run.*

   c. If the firm is operating in the Short Run with \( K = 50 \) units of capital and wants to produce \( q = 650 \) units of output, what level of labor should the firm hire in order to minimize costs of production? Explain. (4 points)

   *In the Short Run the firm will want to use the amount of labor for which \( F(L, K) = \bar{q} \). From the graph above, we have \( L_{SR}^* = 210 \).*
Gene’s utility is given by \( u(X) = 10x_1x_2 \). From here, his marginal utility functions are \( MU_1 = 10x_2 \) and \( MU_2 = 10x_1 \).

a. State an expression for \( MRS_{1,2} \), his “Marginal Rate of Substitution (of good one for good two).” (3 points)

\[
MRS_{1,2} = \frac{MU_1}{MU_2} = \frac{10x_2}{10x_1} = \frac{x_2}{x_1}
\]

b. Graphically illustrate the solution to his “Utility Maximization Problem.” (3 points)

\[\text{Graph of utility maximization problem}\]

\[\text{Graphical representation of optimal consumption levels}\]

For this to be satisfied it must be that: (2a) \( x_2 = \frac{p_1}{p_2}x_1 \). Substituting (2a) into

(1) gives us \( p_1x_1 + p_2\left(\frac{p_1}{p_2}\right)x_2 = I \). From here we obtain \( x_1^* = \frac{I}{2p_1} \). From (2a) it follows that \( x_2^* = \frac{I}{2p_2} \).
Extra Credit!

Consider a firm with the production function:
\[ F(L_1, L_2, K_1, K_2) = \min \left\{ \frac{1}{3} L_1, \frac{1}{4} K_1 \right\} + \min \left\{ \frac{1}{2} L_2, \frac{1}{2} K_2 \right\} \]
Suppose: each unit of \( L_1 \) costs \( w_1 = 6 \); each unit of \( L_2 \) costs \( w_2 = 10 \); each unit of \( K_1 \) costs \( r_1 = 5 \); each unit of \( K_2 \) costs \( r_2 = 3 \). Suppose this firm is operating in the Long Run and wants to produce 100 units of output at lowest possible cost. How much of each factor of production should this firm hire? Explain. (4 points)

To produce 100 units at lowest possible cost, one of the two following options is clearly best:

1. Hire \( \frac{1}{3} L_1 = \frac{1}{4} K_1 = 100 \) (that is, \( L_1 = 300 \) and \( K_1 = 400 \)) and \( L_2 = K_2 = 0 \)

2. Hire \( \frac{1}{2} L_2 = \frac{1}{5} K_2 = 100 \) (that is, \( L_2 = 200 \) and \( K_2 = 500 \)) and \( L_1 = K_1 = 0 \)

Option (1) costs the firm \( (6)(300) + (5)(400) = 1,800 + 2,000 = 3,800 \), while Option (2) costs the firm \( (10)(200) + (3)(500) = 2,000 + 1,500 = 3,500 \). Thus, to produce 100 units of output at lowest possible cost, the firm should hire \( L_2 = 200 \), \( K_2 = 500 \), and \( L_1 = K_1 = 0 \).