A. Multiple choice (60 pts) Place answers (A, B, C, D or E) ON TEST in the space provided.

1. When the total-product curve is increasing at an increasing rate
   a. average product is zero.
   b. marginal product is positive but declining.
   c. the marginal-product curve lies below the average-product curve.
   d. marginal product is positive and increasing.
   e. average product is falling.

2. In the short run, if average total cost is decreasing, then
   a. total fixed costs are decreasing.
   b. average fixed costs are decreasing.
   c. average variable cost is decreasing.
   d. marginal cost is decreasing.
   e. average total cost is no longer equal to the sum of average variable cost and average fixed cost.

3. A rise in the price of a fixed input will cause a firm's
   a. average variable cost curve to shift up.
   b. average total cost curve to shift up.
   c. average total cost curve to shift down.
   d. marginal cost curve to shift up.
   e. marginal cost curve to shift down.

4. Which one of the following types of cost declines over the whole range of output?
   a. average fixed cost
   b. marginal cost
   c. total fixed cost
   d. average variable cost
   e. total variable cost

5. Suppose fixed costs are $100 and average variable costs are constant regardless of output. Which of the following is then true?
   a. marginal cost will equal average total cost
   b. average total cost will decrease when output is increased
   c. marginal cost will be less than average variable cost
   d. average total costs will be constant
   e. none of the above.

6. Suppose a consumer can purchase only two goods, dish soap and apples. If the price of dish soap falls, and the consumption of apples increases, we can conclude that the increased consumption of apples is due to
   a. Neither the income effect nor the substitution effect.
   b. Both the income effect and the substitution effect.
   c. The income effect only.
   d. The substitution effect only.
   e. None of the above.

7. Suppose Potatoes used to be inferior goods for Jimmy, but now they are normal goods. As a result, Jimmy's demand curve for Potatoes
   a. Has become flatter.
   b. Has become steeper.
   c. Has not changed.
   d. Not enough information.
   e. None of the above.

8. If average product equals marginal product and both are positive, then total product
   a. is at a maximum.
   b. is decreasing as extra units of the variable factor are employed.
   c. is increasing as extra units of the variable factor are employed.
   d. may be either increasing or decreasing as extra units of the variable factor are employed.
   e. none of the above.
9. Let X be on the horizontal axis and Y be on the vertical axis. If the demand for X is inelastic \((|\eta| < 1)\) then the price consumption curve for X is
   a. Negatively sloped.
   b. Positively sloped.
   c. A vertical line.
   d. A horizontal line.
   e. We can not tell from the information given.

10. If the average-product curve is rising, then the marginal-product curve
   a. must lie above the average-product curve over this range and must also be rising.
   b. must lie above the average-product curve over this range.
   c. can be either above or below the average-product curve, although it must be rising over the entire range.
   d. must lie below the average-product curve over this range.
   e. must be falling.

11. The relative prices of bacon to beer \((P_{\text{bacon}}/P_{\text{beer}})\) is 1:3. If Bob's current consumption is at a level where \(\frac{MU_{\text{beer}}}{MU_{\text{bacon}}} = 3:1\), then to achieve maximum utility Bob must
   a. Consume more beer and less bacon.
   b. Not change his current consumption of beer and bacon.
   c. Consume less beer and more bacon.
   d. Increase the price of beer.
   e. Consume three times as much beer and one-third as much bacon.

Table 1: The following data show the total output for a firm when specified amounts of labour are combined with a fixed amount of capital. When answering the questions, you are to assume that the wage per unit of labour is $25 and the cost of the capital is $100.

<table>
<thead>
<tr>
<th>Labour</th>
<th>Total Output</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>250</td>
</tr>
<tr>
<td>5</td>
<td>305</td>
</tr>
</tbody>
</table>

12. Refer to Table 1. The marginal product of labour is at its maximum when the firm changes the amount of labour hired from
   a. 0 to 1 unit.
   b. 1 to 2 units.
   c. 2 to 3 units.
   d. 3 to 4 units.
   e. 4 to 5 units.

13. Refer to Table 1. The average product of labour is highest when the firm hires
   a. 1 units of labour.
   b. 2 units of labour.
   c. 3 units of labour.
   d. 4 units of labour.
   e. 5 units of labour.

14. If the price of a normal good changes, the income effect will
   a. always be larger than the substitution effect.
   b. always be positive.
   c. reinforce the substitution effect.
   d. produce a positively sloped demand curve.
   e. None of the above.
15. Suppose the price of good A falls and the consumption of good B rises. We can conclude that
   a. A is a normal good.
   b. B is a normal good.
   c. A is an inferior good.
   d. B is an inferior good.
   e. both A and B are normal goods.

B. Let \( U = 2X^{1/3}Y^{2/3} \), \( P_x = 4 \) and \( P_y = 2 \) and income \( M = 120 \) (40pt)

1. What is the slope of the indifference curve when \( X=9, Y=4 \)?

\[
MRS = \frac{MU_x}{MU_y} = \frac{\frac{1}{3}X^{-\frac{2}{3}}Y^{\frac{2}{3}}}{\frac{2}{3}X^{\frac{1}{3}}Y^{-\frac{2}{3}}} = -\frac{Y}{2X} = -\frac{4}{18} = -\frac{2}{9} = -0.22.
\]

2. What is the equation for income consumption curve?

\[
MRS = -\frac{P_x}{P_y} \implies -\frac{Y}{2X} = \frac{4}{2} \implies Y = 4X
\]

3. What is the equilibrium level of \( X, Y \) and \( U \)?

\[
\begin{align*}
4X + 2Y &= 120 \\
4X &= 10 \\
X &= 10/4 = 2.5 \implies Y = 40/2.5 = 16 \\
U &= 2 \cdot 4^{3/2} \cdot 4^{2/3} = 2 \cdot 2 \cdot 14 \cdot 11.71 = 59.12.
\end{align*}
\]

Let \( P_x \) change to $2

4. What is the equation for the income consumption curve for X.

\[
\frac{Y}{2X} = 1 \implies Y = 2X
\]
5. What are the income and substitution effects for the increase in \( P_x \) (find the intermediate point, both \( X \) and \( Y \))?

\[
C: \quad 2 \times \frac{1}{2} Y^{\frac{1}{2}} = 50.12 \quad \quad 3.176 \cdot X = 50.12 \\
Y = 2X \\
X = 15.78 \\
Y = 31.56 \\
\]

IE: 15.78 \(-\) 20 \\
SE: 10 \rightarrow 15.78

6. Draw a very rough diagram showing the two effects.

![Graph showing income and substitution effects](image)

7. What is the equivalent decrease in income that the increase in the price of \( X \) caused?

\[
\text{bug pt } C: \quad 2 \times 15.78 + 2 \times 31.56 = 94.68 \\
\uparrow \text{ in } M = 120 - 94.68 = 25.32
\]

< Good Luck! >