Name:

Instructions:

1. Write your name above.

2. No baseball caps are allowed (turn it backwards if you have one on).

3. Write your answers in the space provided or on the back side of any page. If you attach additional sheets of paper, be sure to indicate that answers are continued and carefully identify any work that carries over.

4. After you have completed the exam, sign the Honor Code statement below.

HONOR CODE PLEDGE: I affirm that I have neither given nor received aid on this exam.

Signature:

Multiple Choice (2 points per question)

1. Theory suggests that the supply curve of labor is:
   (a) upward-sloping.
   (b) horizontal.
   (c) downward-sloping.
   (d) downward-sloping for some wage levels, and upward-sloping for others.

2. The labor market demand curve for labor is [BLANK]-sloping and [BLANK] than the horizontal sum of individual demand curves.
   (a) upward; flatter
   (b) upward; steeper
   (c) downward; steeper
   (d) downward; flatter

3. In the context of the retirement model, an increase in a worker’s wage rate, ceteris paribus, will
   (a) delay retirement if the substitution effect is dominant.
   (b) increase the years a worker is retired by both the income and substitution effects.
   (c) induce earlier retirement since there is no income effect.
   (d) expedite retirement since only an income effect is present.
4. The intertemporal substitution hypothesis suggests that

(a) labor force participation rates and hours worked increase when wages are higher as people substitute time over the life cycle to take advantage of changes in the price of leisure.
(b) wage increases over the lifecycle generate income effects which cause workers to spend less time working and more time enjoying leisure during their “prime years.”
(c) the age earnings profile is “U-shaped,” since earnings first decrease and later increase as a worker ages.
(d) there exists only a substitution effect when comparing the wage profiles of two different workers.

5. Relatively more curved isoquants represent combinations of inputs which are [BLANK] in the production process and have a relatively [BLANK] elasticities of substitution.

(a) substitutes; small
(b) substitutes; large
(c) complements; small
(d) complements; large

6. A firm whose production technology involves the use of perfect complements will demand

(a) only labor when the wage rate exceeds the rental price of capital.
(b) the same quantity of labor and capital, regardless of input prices.
(c) more capital only when more labor is demanded, and vice versa.
(d) only labor when the rental price of capital exceeds the wage rate.

7. Consider a firm where production depends on two inputs - labor and capital - with prices \( w \) and \( r \), respectively. Initially the firm faces market prices of \( w = 6 \) and \( r = 4 \). These prices then shift to \( w = 4 \) and \( r = 2 \). The prices changes will cause

(a) an increase in the quantity of labor used because of the substitution effect.
(b) a decrease in the quantity of capital used because of the dominant scale effect.
(c) a decrease in the quantity of labor used because of the scale effect.
(d) an increase in the quantity of capital used by both the scale and substitution effects.

8. A firm that experiences an increase in the rental price of capital will

(a) utilize more labor if the substitution effect dominates.
(b) utilize more capital if the scale effect dominates.
(c) not change its input combination regardless of which effect dominates.
(d) utilize less labor if the substitution effect dominates.
9. If the cross-price elasticity of demand between two inputs is -1.46, we can conclude that the inputs are
   (a) substitutes.
   (b) normal goods.
   (c) complements.
   (d) inferior goods.

10. Monopsonies are characterized
    (a) as markets with upward-sloping labor supply curves.
    (b) by firms which must take P and w as given.
    (c) as markets which have only one seller of the output.
    (d) by firms which face upward-sloping labor supply curves.

11. Non-discriminating monopsonists hire [BLANK] workers than a competitive firm would and pay [BLANK].
    (a) more; a worker his or her reservation wage.
    (b) fewer; all workers the same wage.
    (c) more; all workers the same wage.
    (d) fewer; a worker his or her reservation wage.

12. Firms with monopoly power hire workers up to the point where
    (a) \( P \cdot MP_E = w \).
    (b) \( MR = MC \).
    (c) \( MR \cdot MP_E = w \).
    (d) \( \frac{w}{r} = \frac{MP_K}{MP_E} \).
1. (21 points) Suppose Maggie is offered an hourly wage of \( w \), her non-labor income is \( V \), consumption (C) is measured in dollars, and she has 40 hours to work (H) or leisure (L). Suppose also that Maggie derives utility from consumption and leisure according to the utility function:

\[
U = 15C^{\frac{4}{5}}L^{\frac{1}{5}}
\]

Her marginal utility functions are:

\[
MU_L = 3C^{\frac{3}{5}}L^{-\frac{2}{5}}
\]
\[
MU_C = 12C^{-\frac{1}{5}}L^{\frac{1}{5}}
\]

(a) (7 points) State and interpret the utility-maximization rule that Maggie uses to determine the optimal number of hours she should work. Then use that rule to determine how many hours Maggie will work if she consumes $800 in consumption goods and is offered a wage of $20 per hour. Then, use the same rule to solve for the optimal number of hours worked when consumption decreases to $480 and wages decrease to $10 per hour. Graph (and label) the budget constraints, these two consumption bundles, and the corresponding indifference curves in the space provided. Be sure to label the intercepts and the slope of the budget constraints.

\[
C_1 = 800, \ w_1 = 20, \ H_1^* =
\]
\[
C_2 = 480, \ w_2 = 10, \ H_2^* =
\]

(b) (5 points) Calculate and interpret Maggie’s elasticity of labor supply when the wage rate changes from $20 to $10 per hour. Is her responsiveness to wage changes elastic or inelastic? Does this suggest a dominant income or substitution effect for Maggie? Explain.
(c) (6 points) Finally, on the original graph, illustrate this wage change graphically (with appropriate labels, slope, intercepts, etc). Maggie's hours worked will now increase / decrease / change ambiguously (circle one). Explain using income/substitution effects. Decompose the graphical change in hours worked into income and substitution effects. [Note: Your graph should correspond to your answer(s) in part (a).]

(d) (3 points) Calculate the minimum wage offer that would make Maggie enter the labor market if, in addition to her current non-labor income, she were to receive welfare payments in the amount of $280.

2. (21 Points) Consider a perfectly competitive firm with the following production function:

\[ q = 10K^{\frac{1}{2}}E^{\frac{1}{2}} \]

The corresponding marginal product of labor and marginal product of capital functions are:

\[ MP_E = 5K^{\frac{1}{2}}E^{-\frac{1}{2}} \]
\[ MP_K = 5K^{-\frac{1}{2}}E^{\frac{1}{2}} \]

Suppose that \( r = $80 \) and that the firm’s output sells in the market at a price of $8.

(a) (4 points) Assume initially that the firm is in the short-run. State and interpret the short-run profit-maximizing input condition. If the firm has hired 15 machines, how many workers should it employ if workers are paid $20 per hour? How many workers should the firm hire if the wage rate decreases to $10 per hour, all else constant?

\[ w_1 = $20, E_1^* = \]

\[ w_2 = $10, E_2^* = \]
(b) (3 points) Suppose the firm is instead operating in the long-run (you may assume this for the duration of this problem). State the firm’s profit-maximizing condition and use it to solve for the optimal number of employees that should be hired when the wage rate is $20, the price of capital is $80, and 15 machines have been rented. Additionally, solve for the profit-maximizing employment level if the quantity of capital used in the production process increases to 20 and the wage rate decreases to $10.

\[ K_1 = 15, \ w_1 = $20, \ E_1^* = \]
\[ K_2 = 20, \ w_2 = $10, \ E_2^* = \]

(c) (4 points) Use your answers from parts (a) and (b) to graph (and label) both the short- and long-run demand curves for labor. Also, explain the difference between the two curves (namely, the slopes) using what you know about elasticity, assumptions about the short- and long-run, etc.

(d) (3 points) Use your answers from part (b) to calculate and interpret this firm’s long-run elasticity of demand for labor when the wage rate decreases from $20 to $10. Is this considered an elastic or inelastic demand curve for labor?
(e) (2 points) Use your understanding of the Marshallian Rules of Derived Demand to state and explain two factors that will cause a labor market demand curve to have the elasticity you calculated in part (d).

(f) (5 points) Finally, describe the scale and substitution effects in the context of this firm’s response to the wage decrease from $20 to $10. State which effect is dominant, and decompose in the space below.
3. (15 points) Use your answers from questions (1) and (2) to graph the perfectly competitive labor market.

(a) (5 points) Specifically, plot the supply curve using your answers from question (1) for wages of $20 and $10. Then, depict the long-run demand curve for labor using the same wages and your answers for question (2). Assume that there are 60 workers like Maggie in #1 and 30 firms identical to the one described in #2. After graphing the supply and demand curves (using specific (E,w) points), identify and label the equilibrium wage rate, $w^*$, and employment level, $E^*$.

(b) (5 points) Graphically and in words, illustrate above and describe below how the imposition of a minimum wage would affect this perfectly competitive market. Draw an “effective” minimum wage, describe how E and w would change, and discuss the unemployment rate.

(c) (5 points) Ignoring the minimum wage from part (b), describe the effect a payroll subsidy would have on this market. Which curve(s) would shift, in which direction, and how would $E^*$ and $w^*$ change as a result of the subsidy? What would the unemployment rate be?
4. (9 points) Describe and illustrate graphically the hiring decisions of the following non-competitive labor markets. How does each outcome (E* and w*) compare to competitive labor markets?

(a) (3 points) Discriminating Monopsony

(b) (3 points) Non-Discriminating Monopsony

(c) (3 points) Monopoly