ECON 001
Fall 2021
Final
December 21, 2021
Time Limit: 120 Minutes

Name (Print): _____

Penn ID number: _____
(8 digits)

- This exam contains 13 pages (including this cover page) and 16 questions. Check to see if any pages are missing.

- The exam is scheduled for 1 hour.

- The total score is 24 points.

- This is a closed-book, closed-note, no calculator exam.

- Answer each multiple-choice question by filling in the bubble for the answer you select. Make sure that the bubble is clearly filled in, or it will be marked incorrect.

- Write your answers to the short answer questions in the spaces provided for them. Do not write your answers outside of the boxes.

- Do not remove any pages or add any pages. No additional paper is supplied

- Show your work when asked. Label all graphs carefully.

- This exam is given under the rules of Penn's Honor system.

My signature certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination.

Please sign here _____ Date _____

Multiple Choice Questions (best 12 out of 13: 9 points)

1. (1 point) Aaron is spending the weekend at his aunt's house in the Jersey Shore. Once there, he has three choices for how to spend his day. He can go to the beach with his friends, at a benefit of $20 and no cost, he can see the new Boss Baby movie for $15 but values it at $25, or he can go to a picnic, where he will spend $20 on food but would be willing to spend up to $35 to go. What is the opportunity cost of going to the movies?

   ○ $25

   ○ $20

   √ **$35**

   ○ $10

2. (1 point) When Sally goes to the store each week, she purchases 4 packages of cookies and 3 pints of ice cream. This week the price of cookies increased, and she only purchased 2 pints of ice cream. Which of the following must be true?

   I. Ice cream is a normal good for Sally

   II. Ice cream is an inferior good for Sally

   III. Cookies and ice cream are complements for Sally

   IV. Cookies and ice cream are substitutes for Sally

   ○ I and IV

   ○ II and III

   √ **I and III**

   ○ III only

   ○ IV only

   ○ II and IV

3. (1 point) Every week, Sarah spends $30 to buy apples or oranges, and she views 2 oranges as a perfect substitute for 1 apple. To buy fruits, Sarah has two options:

   - She can walk to Trader Joe's at no cost, where prices of apples and oranges are $5.5 and $2.5 respectively, or

   - She can take an Uber for $6 round trip to go to Aldi, where the prices of apples and oranges are $3 and $2 respectively.

   Which of the following is correct?

   √ **Sarah prefers to shop at Aldi**

   ○ Sarah prefers to shop at Trader Joe's

   ○ She is indifferent between shopping at Aldi and at Trader Joe's

   ○ Not enough information.

4. (1 point) Bob owns a food truck selling sandwiches in a competitive market. Bob's total costs are $TC(q) = 16 + 8q + q^2$ and his marginal costs are $MC(q) = 8 + 2q$. If the market price is P = $10, which of the following statements are true?

   I. Bob shuts down his food truck immediately (in the short run)

   II. Bob makes a negative profit

   ○ Only I

√ **Only II**

○ Neither I nor II

○ Both I and II

5. (1 point) Suppose the market for coffee in Philadelphia is perfectly competitive and in a long run equilibrium. A new study comes out in The Daily Pennsylvanian that shows that higher coffee consumption leads to higher scores on tests. How does this study affect the new **long run** equilibrium?

   ○ The quantity of coffee produced by each coffee shop increases

   ○ The price of coffee increases

   ○ The average total cost (ATC) of the coffee shops increases

   √ **None of the above is true**

6. (1 point) The market for chocolate chips bagels is characterized by a downward-sloping demand and a perfectly inelastic supply. Suppose the government imposes a binding price floor. Which of the following statements are true above the market outcome?

   I. The outcome will be inefficient because too few bagels will be exchanged

   II. The outcome will be inefficient because producer surplus will be too large

   III. The outcome will be efficient because the supply is perfectly inelastic

   √ **Only I**

   ○ Only II

   ○ Only III

   ○ I and II

   ○ II and III

   ○ I, II and III

7. (1 point) Belgium and France produce waffles and éclairs. The French labor force is six times as large as the Belgian labor force. A French worker can produce either 1 waffle or 3 éclairs per hour. A Belgian worker can produce either 2 waffles or 2 éclairs per hour. Suppose France and Belgium trade pastries on the world market at a price of 1 waffle for 4 éclairs. Which of the following are true?

   I. France has absolute advantage in éclair production over Belgium.

   II. Belgium has comparative advantage in éclair production over France.

   III. France should specialize in éclair production.

   IV. Belgium should specialize in waffle production.

   V. Belgium has absolute advantage in waffle production over France.

   ○ I and V, only.

   ○ I, III, IV, and V, only.

   ○ I, II, IV, and V, only.

   √ **I, IV, and V, only.**

   ○ All of the above

8. (1 point) Al and Edward live in Central City. The park near their homes has fallen into disarray and so the government is considering a plan to have it regularly landscaped. Al's benefit from the landscaping is $MB^A = 80 - 20q$, while Edward's is $MB^E = 30 - 10q$, where q is the number of visits by the landscaping crew per month. If it costs \$50 per visit, what is the efficient number of visits q_E per month?

- ◯ $q_E = 30/20$
- ✓ $q_E = 2$
- ◯ $q_E = 0$
- ◯ $q_E = 3$

9. (1 point) Sky Rover is a single price monopoly that produces flying cars. It faces a downward sloping demand and increasing marginal cost. The production of Sky rover cars generates rocket gas, which purifies the air and has a positive externality bystanders. Suppose the government can give Sky Rover a per-unit subsidy equal to the marginal external benefit it generates. Which of the following is true:

- ◯ Sky Rover will produce the efficient quantity with the subsidy and consumer surplus will be higher than with no subsidy.
- ◯ Sky Rover will produce the efficient quantity with the subsidy and consumer surplus will be lower than with no subsidy.
- ✓ **Sky Rover will produce less than the efficient quantity with the subsidy and consumer surplus will be higher than with no subsidy.**
- ◯ Sky Rover will produce less than the efficient quantity with the subsidy and consumer surplus will be lower than with no subsidy.
- ◯ None of the above.

10. (1 point) The market for cereal is monopolistically competitive. Which of the following is true in long-run equilibrium?

- ◯ Relative to the short-run, a firm's average cost curve increases until it is tangent to the firm's demand.
- ✓ **Relative to the short-run, a firm's demand becomes more elastic.**
- ◯ Firms choose to produce the quantity at which their marginal cost equals the market price.
- ◯ A firm's demand curve is tangent to its marginal cost curve.

11. (1 point) What is true about the following game? *(in each cell, the first payoff goes to Row and the second payoff goes to Column)*

Column

		L	R
Row	T	$1, 1$	$-1, 2$
	B	$2, -1$	$0, 0$

   I. The game has a dominant strategy equilibrium.
  II. (B; R) is a Nash equilibrium.
 III. The game has a Nash equilibrium that is Pareto Efficient
  IV. The game has more than one Nash equilibrium

- ◯ I only
- ◯ II only
- ◯ III only
- ◯ IV only
- ✓ **I and II**
- ◯ II and IV
- ◯ II and III
- ◯ III and IV

12. (1 point) Jeffery and Walter both work as personal assistants to Sam Elliott. Both currently supply 30 hours of labor per week. In a moment of generosity, Mr. Elliott increases both of their pay by twenty percent. Given this increase Jeffery decides to work 25 hours per week and Walter decides to work 33 hours per week. Which of the following statements is correct?

   I. For Walter, leisure *must be* a normal good

   II. For Jeffery, leisure *can be* an inferior good

   II. The cost of leisure *must be* higher for Walter than for Jeffery

   ○ I only

   ○ II only

   ○ III only

   ○ I and II

   ○ I and III

   ○ II and III

   ○ I, II and III

   √ **None**

13. (1 point) Suppose the Duke of Arrakis institutes a child tax credit, which provides subsidies to low-income households with children. As a result of this policy:

   I. The income Lorenz curve will move further away from the 45 degree line

   II. The (income) Gini coefficient will decrease

   ○ I only

   √ **II only**

   ○ I and II

   ○ Neither I nor II

Short Answer Questions (16 points total)

To get any point you must show your work

14. Consider a world with only two countries: Malaysia and Indonesia. The Malaysian market (domestic) for palm oil can be described by a downward sloping demand $P = 30-2Q_D$ and an upward sloping supply $P = 6 + Q_S$. The quantity is measured in million pounds.

   (a) When international trade is not allowed *(Show your work in the box below)*:
      - The autarky price for the palm oil is _____ **14** _____ dollars per pound.

      - Consumer surplus is _____ **64** _____ million dollars

      - Producer surplus is _____ **32** _____ million dollars.

      > **Solution:** The autarky price is the price such that domestic demand intersects domestic supply: $30 - 2Q = 6 + Q$, so $Q = 8$million pounds , $P = \$14$per pound. Consumer surplus is the area below domestic demand, above the price consumers pay, up to the quantity they buy: $CS = 0.5 \times (30 - 14) \times 8 = 64$million dollars . Producer surplus is the area above domestic supply, below the price producers receive, up to the quantity they sell: $PS = 0.5 \times (14 - 6) \times 8 = 32$million dollars.

   (b) Suppose the price for palm oil when trading with Indonesia is $P_W = \$10$ per pound. With free trade:
      - Imports are _____ **6** _____ million pounds of palm oil.

      - Compared to autarky *(increases/ decreases/ does not change)*:
        - Domestic consumer surplus in Malaysia _____ **increases** _____

        - Domestic producer surplus in Malaysia _____ **decreases** _____

   (c) The Malaysian government decides to impose a tariff of $2 per pound. With the tariff:
      - Imports are _____ **3** _____ million pounds of palm oil.

      - The government's tariff revenue is _____ **6** _____ million dollars.

      - Compared to free trade *(increases/ decreases/ does not change)*:
        - Domestic consumer surplus in Malaysia _____ **decreases** _____

        - domestic producer surplus in Malaysia _____ **increases** _____

      > **Solution:** With $2 tariff, the price is now $12. Consumers in Malaysia will consume 9 million pounds of palm oil. The domestic producers will provide 6 million pounds, and the country imports the additional 3 million pounds from Indonesia. Under this policy, the consumer surplus is 0.5*(30-12)*9 = 81 million dollars, which decreases compared to the free trade. The domestic producer surplus is 0.5*(12-6)*6 = 18 million dollars, which increases compared to the free trade. The total tariff revenue is 2*3 = 6 million dollars.

   (d) Suppose the world price is still $P_W = \$10$ per pound, and there is still a $2 tariff. A technological advancement for processing palm oil in Malaysia increases Malaysia's domestic supply *(it shifts out)*. The new domestic supply is $P = Q_S$.
      - The new prevailing price in Malaysia is _____ **10** _____ dollars per pound.

      - Malaysia _____ **10** _____ [NewQuantity] to/from Indonesia.

15. Suppose PEKO is a natural monopoly for electricity in University City. The market demand for electricity is given by $P = 10 - 0.1Q$ where units of Q are in MWh and the price is in dollars. Assume its fixed cost and marginal cost are given by $FC = \$100$ and $MC = \$2$, respectively.

   (a) Plot the market demand (D), marginal cost (MC), and marginal revenue (MR) on the graph below. Label <u>all</u> intercepts.
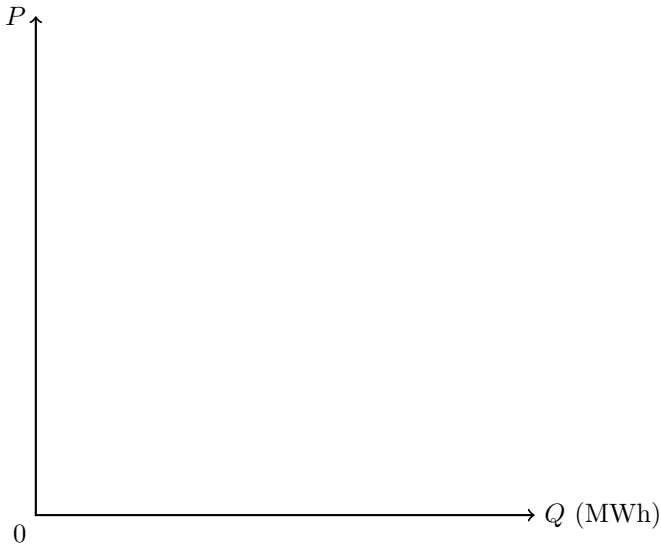
   Solution: $MR = 10 - 0.2Q$
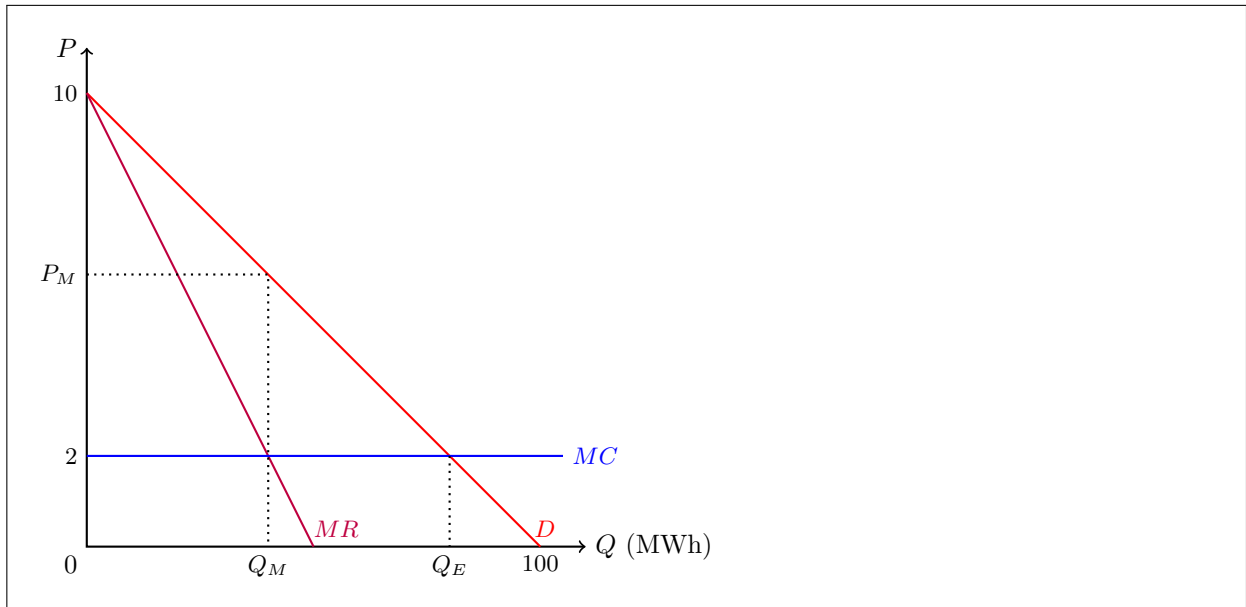
(b) Fill-in the blanks and label Q_M, P_M and Q_E on the graph above:

- The monopoly quantity is $Q_M = $ _____ **40** _____

- The monopoly price is $P_M = $ _____ **6** _____ dollars

- The efficient quantity is $Q_E = $ _____ **80** _____

- The deadweight loss generated by the monopoly is $DWL = $ _____ **80** _____

> **Solution:** The market is not efficient because $MB = 6$ is greater than $MC = 2$ at $Q_M = 40$. To compute the deadweight loss, we first find the socially efficient quantity (Q_E). At Q_E, $10 - 0.1Q_E = 2 \Rightarrow Q_E = 80$. So, $DWL = 0.5 \times (80 - 40) \times (6 - 2) = 80$

(c) Suppose the government is considering granting a per-unit subsidy to the firm in order to restore efficiency, without imposing any price regulation. *Show your work in the box below.*

- The government should grant a subsidy $s = $ _____ **8** _____ dollars per unit

- The government expenditure would be equal to _____ **640** _____ dollars.

> **Solution:** Suppose the size of subsidy is s. Then, you can think of it as a reduction in MC or an increase in MR. Either way you will get the same answer. Suppose the marginal cost curve shifts down by s. Then, $10 - 0.2Q_E = 2 - s \Rightarrow s = \$8$. If you assume the marginal revenue shifts up by s, then $10 - 0.2Q_E + s = 2 \Rightarrow s = \$8$. Then, the government expenditure is $s \times Q_E = \$8 \times 80 = \$640$.

(d) The government realizes that a per-unit subsidy by itself is too costly and now considers regulating it with marginal cost pricing.

    i. Explain why the government should subsidize PEKO to achieve efficiency.

> **Solution:** With marginal cost pricing, PEKO will make a loss. Therefore, it will exit the market in the long run. To avoid exit, the government should subsidize PEKO.

ii. Suppose the subsidy is a per-unit subsidy *(Show your work in the box below)*:
   • The government should grant a subsidy $s =$ _____**1.25**_____ dollars per unit

   • The government expenditure would be equal to _____**100**_____ dollars.

> **Solution:** Since its loss equals to its fixed cost and the socially optimal quantity is 80, the optimal size of the per-unit subsidy is $100/80 = $1.25
>
> The government expenditure will be simply $100, which is equal to PEKO's fixed cost.

(e) Suppose environmentalists are strongly against the above polices because they think that power plants producing electricity emit pollutants which contribute to global warming. Suppose the marginal external cost generated by PEKO is $4 per MWh.

  i. Fill-in the blanks *(Show your work in the box below)*:
   • The socially efficient quantity is $Q'_E =$ _____**40**_____

   • The total external cost at the socially efficient quantity is equal to _____**160**_____ dollars

> **Solution:** At the socially efficient quantity (Q_E), $10 - 0.1Q_E = 2 + 4 \Rightarrow Q_E = 40$. The total external cost is $4 \times Q_E = 160.

  ii. Should a per-unit tax or subsidy be introduced to achieve a socially efficient quantity? If so, find its amount.

> **Solution:** Since the socially efficient quantity is the same as the monopoly quantity, the outcome is socially efficient without any tax or subsidy policies.

  iii. Now suppose that PEKO can perfectly price discriminate. Should a per-unit tax or subsidy be introduced to achieve a socially efficient quantity? If so, find its amount.

> **Solution:** PEKO will produce where $MB = MC$. Therefore, it overproduces because $10 - 0.1Q_M = 2 \Rightarrow Q_M = 80$. So, a per-unit tax should be introduced. The optimal size of tax can be obtained by $10 - 0.1Q_E = 2 + t \rightarrow t = 4.

16. The perfectly competitive market for automobiles is characterized by an upward-sloping supply curve $Q_S = P+4$ and a downward-sloping demand curve $Q_D = 8-P$. Consider the labor market for automobile workers. Suppose the marginal revenue product of labor is given by $MRP_L = 60 - L$.

(a) Find the marginal product of labor for each worker as a function of L (Show your work in the box below):
$MP_L = \underline{\qquad 30 - 0.5L \qquad}$

> **Solution:** Since the output market is perfectly competitive, our first step is to find the equilibrium price, which we will use to calculate $VMP_L = MRP_L$. To find equilibrium price, we set $Q_S = Q_D$, which yields $P = 2$. Next, we plug this into the formula $MRP_L = VMP_L = P \cdot MP_L$, so $60 - L = 2 \cdot MP_L$. Thus the marginal product of labor for each worker $MP_L = 30 - 0.5L$.

(b) Suppose the labor market is perfectly competitive, with a market labor supply S_L given by $w = 2L$ and a market labor demand D_L given by $w = 60 - L$. Fill-in the blanks:

  • The competitive equilibrium level of employment is $L = \underline{\qquad 20 \qquad}$

  • The competitive equilibrium wage is $w = \underline{\qquad 40 \qquad}$

> **Solution:** We can set quantity of labor supplied and quantity of labor demanded equal to each other and solve: $60 - L = 2L$ so $L = 20$. Plugging this into either the labor demand or the labor supply equation, we find the equilibrium wage $w = 40$.

(c) Suppose that gasoline prices rise, causing demand for automobiles to fall. On the two graphs below, draw (1) the effect of this change on the output market, (2) the effect on the labor market, and (3) the feedback effect of the change you drew in (2) on the output market. Explain in words the effect of this change in the output market on prices and quantities in both markets.

P

Q

0

w

L

0
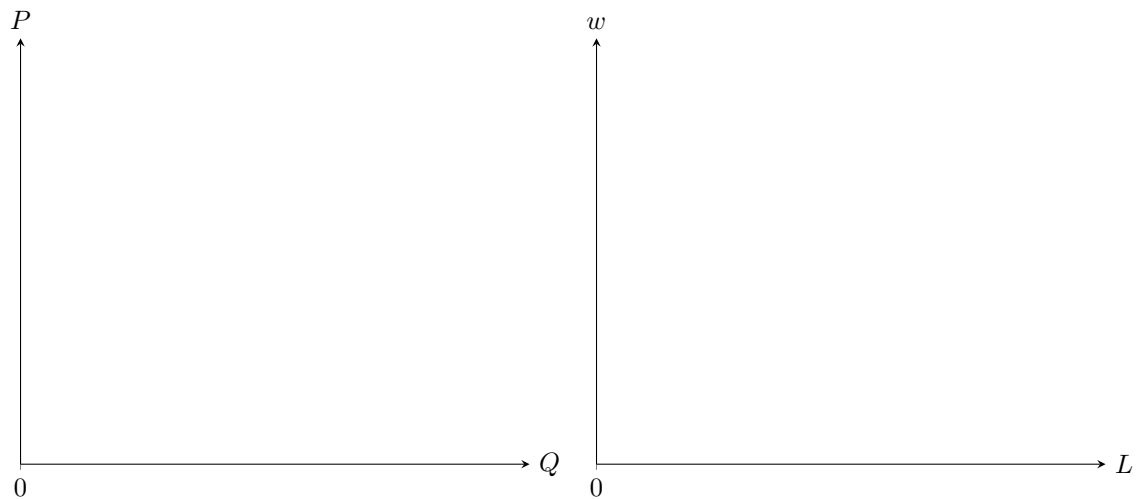
> **Solution:**
> See the graphs below. Output demand shifts left, lowering the price, and thus decreasing the labor demand due to decreased marginal revenue product (rotates inward). This decreases the wage, which increases output supply because lower wages mean lower costs of production.
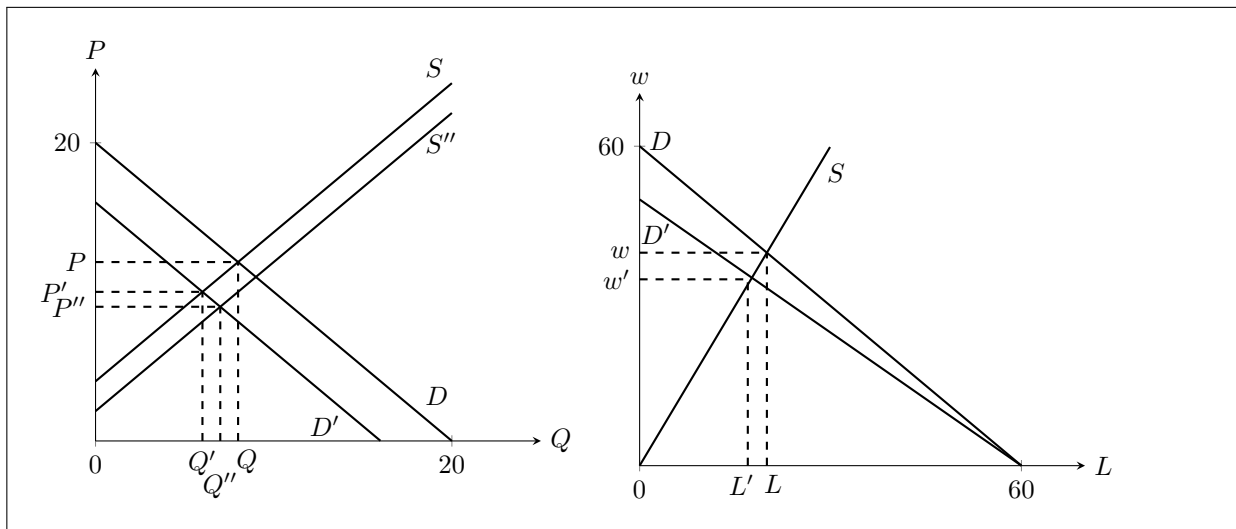
(d) Suppose now that automobile manufacturers coordinate to make the labor market for automobile workers a monopsony. In the graph below, draw the marginal revenue product of labor MRP_L, labor supply S_L, and marginal cost of labor MC_L. Make sure to label all intercepts.
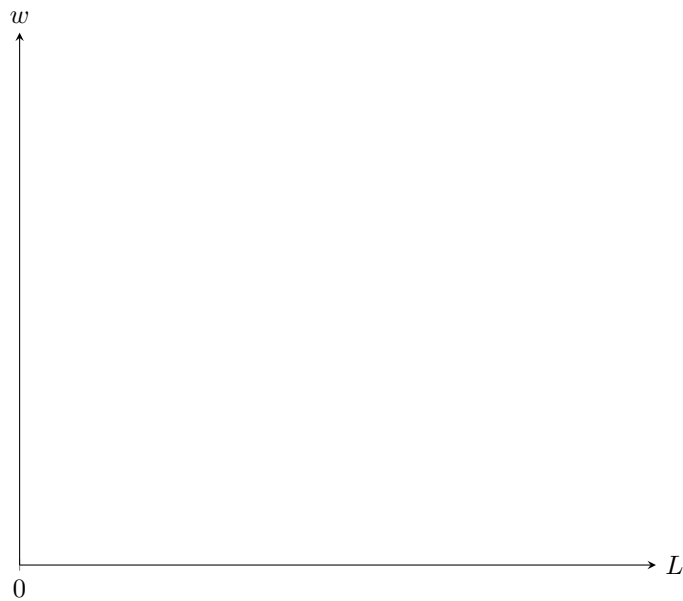

Fill-in the blanks and label w_m and L_m on the graph above:

- The monopsony equilibrium level of employment is $L_m = $_____**12**_____

- The monopsony equilibrium wage is $w_m = $_____**24**_____

- The monopsony equilibrium level of unemployment is _____**0**_____

Solution:

The monopsonist's marginal cost curve is simply double the slope of the supply curve; $MC = 4L$. We set this equal to demand, or marginal revenue product, to solve for L. Doing this, we obtain $L = 12$. Then, to find the monopsony wage we plug this labor quantity into the labor supply curve to find $w = 24$. There is no unemployment.
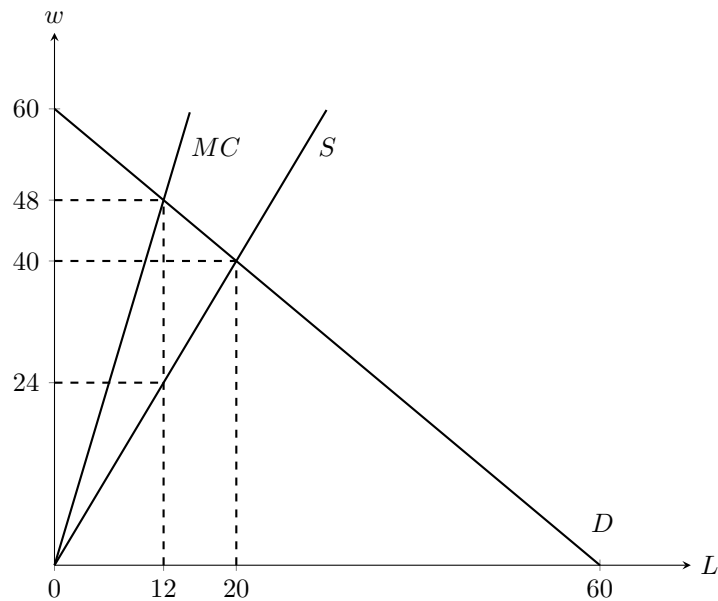
(e) Congress is considering imposing a minimum wage of \$30. Describe in words the effects of the minimum wage:

- On employment and unemployment

- On the deadweight loss, if any.

Solution:

Employment increases from 12 to 15, which is found by plugging the minimum wage of 30 into the labor supply curve. There is still no unemployment, as labor supply does not exceed labor demand at the wage of \$30. Deadweight loss is reduced as we move towards the efficient quantity of labor.