Homework 5

Problem 1

Joey, Mandy, and Jim have the following labor supply (hours per day, based on hourly pay).

Wage	Joey	Mandy	Jim
$5	4	0	2
$10	8	4	6
$15	12	8	9

1. Who values their time more, Joey, Mandy, or Jim (or is there not enough info to say)?
2. What is total labor supply given a wage of $15?
3. What if the demand for labor were fixed at 18 (i.e., firms wanted a total of 18 hours per day, regardless of wage). What would the equilibrium wage?

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Problem 2

You run a factory that uses pottery wheels to make pots. You can hire anywhere between 1 and 3 skilled artisans (workers), and you can rent 1 or 2 pottery wheels (machines). Pots sell for $100 each. The total product of your factory (per day) is shown in the following table.

Number of Machines (Capital, K) \ Number of Workers (Labor, L)	1	2	3
1	**6**	9	11
2	8	12	15

1. Given one machine and one worker, how much would you be willing to pay to hire a 2nd worker? (Consider the value of the marginal product of labor.)
2. Again starting from one machine and one worker, what rental rate would you be willing to pay to acquire a 2nd machine? (Consider the value of the marginal product of capital.)
3. Suppose wage is $250 (per day). How many workers would you hire if you have one pottery wheels? How many workers would you hire with two pottery wheels?
4. Are pottery wheels labor saving or labor complementary?

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Problem 3

You are a monopolist facing the following demand schedule. You produce a good at a constant marginal cost of $4 each.

Quantity	Price
1	14
2	12
3	10
4	8

1. Calculate the marginal revenue for each row (assume revenue is zero when quantity is zero).
2. What is the profit maximizing quantity? Try to do so without actually calculating profit.
3. Assuming a fixed cost of $10 to operate, what is the profit?

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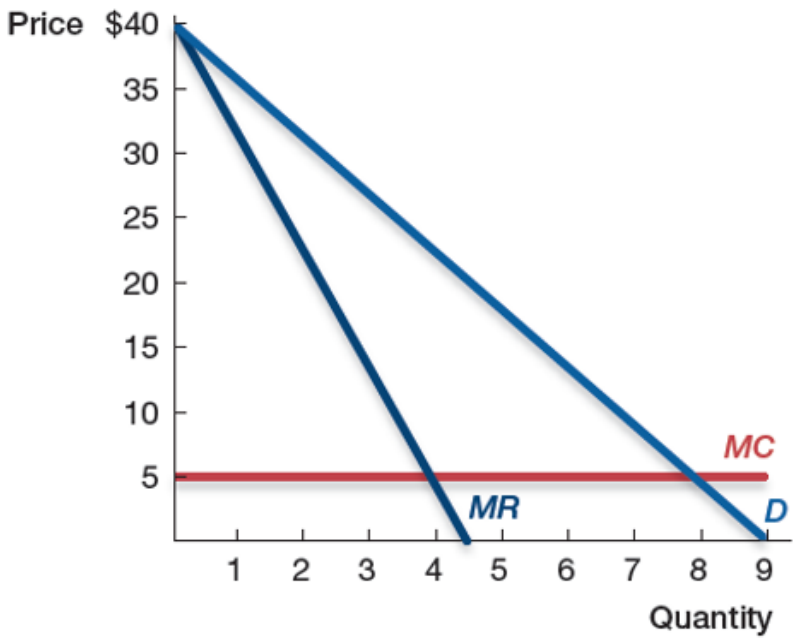
Problem 4

The following graph shows the demand, marginal revenue, and marginal cost curves in a monopoly market.



Demand: $P = -\frac{35}{8}Q + 40$
Marginal revenue: $P = -\frac{35}{4}Q + 40$
Marginal cost: $MC = 5$

1. Identify the profit-maximizing price and quantity for this monopolist.
2. What is the value of the consumer surplus, producer surplus, and deadweight loss in the market?
3. How would consumer surplus change if this market was competitive?

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Suggested Solution

Problem 1

1. Mandy values her time the most since she is willing to supply the least amount of labor for any given wage.
2. $12 + 8 + 9 = 29$ total hours will be supplied at a wage of \$15.
3. A wage of \$10 would bring the market into equilibrium since at wage = \$10, the total supply of labor is exactly $8 + 4 + 6 = 18$.

Problem 2

1. You would be willing to pay up to \$300 since the marginal product of a 2nd worker is $9 - 6 = 3$, and each pot sells for \$100, so VMPL = \$300.
2. You would be willing to pay a rental rate of up to \$200 since the marginal product of a 2nd machine is $8 - 6 = 2$ and each pot sells for \$100, so VMPK = \$200.
3. With one pottery wheel: wage = \$250 implies you want a 2nd worker but not a third since the third worker has marginal value of only $\$100 * (11 - 9) = \$200 < \$250$. With two pottery wheels, a third worker is worth it since $\$100 * (15 - 12) > \$250$.
4. Pottery wheels are labor complementary since they increase the marginal product of labor: For the second worker $(12 - 8) > (9 - 6)$ and for the third worker $(15 - 12) > (11 - 9)$.

Problem 3

1. See table below.

Quantity	Price	Revenue	MR
1	14	14	14
2	12	24	10
3	10	30	6
4	8	32	2

2. Producing Q = 3 is worth it since MR = \$6 is greater than the marginal cost of \$4. However, we should not produce Q = 4 since MR = \$2 is less than the marginal cost of \$4. This means we should set price at \$10 and sell three units.

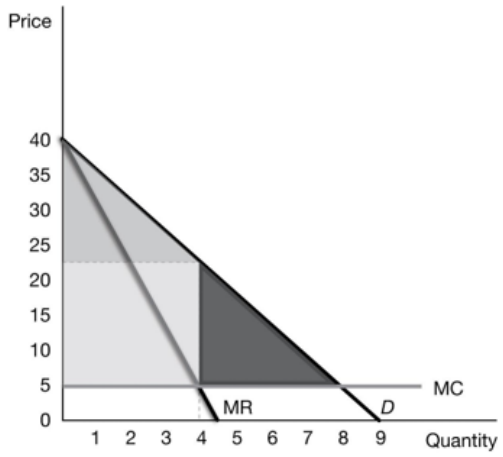
3. The profits are shown in the table. For Q = 3 it is \$8, the maximum possible. Notice that we did not have to calculate this column to determine the best possible profit.

Quantity	Price	Revenue	MR	Profit (with FC=10)
1	14	14	14	$14 - 4 - 10 = 0$
2	12	24	10	$24 - 8 - 10 = 6$
3	10	30	6	$30 - 12 - 10 = 8$
4	8	32	2	$32 - 16 - 10 = 6$

Problem 4

1. The monopolist will maximize profits by producing at the quantity at which marginal cost equals marginal revenue. The marginal revenue curve intersects the marginal cost curve at a quantity of 4 units. Reading off the demand curve, the monopolist should set a price equal to \$22.50.

2. The value of consumer surplus (the area highlighted in medium gray in the figure) = $0.5 * 4 * (\$40.00 - \$22.50) = \$35$. The value of producer surplus (the area highlighted in light gray in the figure) = $4 * (\$22.50 - \$5.00) = \$70$. Deadweight loss (the area highlighted in dark gray in the figure) = $0.5 * (8 - 4) * (\$22.50 - \$5.00) = \$35$.



3. If this market was competitive, a firm would produce at the point where the demand curve intersects the marginal cost curve. The area above the marginal cost curve and below the demand curve would be equal to consumer surplus. The value of consumer surplus = $0.5 * 8 * (\$40 - \$5) = \$140$.