Practice Exam 1 Answer Key

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Problem (30 points)

Show all work. You may *not* earn full credit if you only write the answer, even if correct.

11,. Suppose you can buy Drinks (D) and Wings (W) at a local bar.

a. **Suppose you have a budget of \$120/month to spend, the price of a Drink is \$3.00, and the price of a plate of Wings is \$4.00. Write a *graphable* equation for the budget constraint, and graph it on the first graph below. (3 points)**

$$\begin{aligned} 3D + 4W &= 120 \\ 4W &= 120 - 3D \\ W &= 30 - 0.75D \end{aligned}$$

See original red line on first graph below.

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b. **Suppose you earn utility according to the function:**

$$\begin{aligned} u(D,W) &= DW \\ MU_D &= W \\ MU_W &= D \end{aligned}$$

Write an equation for your *marginal rate of substitution* between D and W. (3 points)

$$\begin{aligned} MRS_{D,W} &= \frac{MU_D}{MU_W} \\ MRS_{D,W} &= \frac{W}{D} \end{aligned}$$

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c. **Calculate the *optimum* quantities of D and W that maximizes your utility subject to your constraints. Plot this point on the first graph below, (call it point *A*), and sketch an indifference curve through that point. (10 points)**

$$\begin{aligned} \frac{MU_D}{MU_W} &= \frac{p_D}{p_W} \\ \frac{W}{D} &= \frac{3}{4} \\ W &= \frac{3}{4}D \end{aligned}$$

Plug this into the budget constraint:

$$
\begin{aligned}
3D + 4W &= 120 \\
3D + 4(\frac{3}{4}D) &= 120 \\
3D + 3D &= 120 \\
6D &= 120 \\
D^* &= 20
\end{aligned}
$$

Knowing $D^* = 20$, we can find W^*:

$$
\begin{aligned}
W &= \frac{3}{4}D \\
W &= \frac{3}{4}(20) \\
W^* &= 15
\end{aligned}
$$

This point, $(D^*, W^*) = (20, 15)$ is plotted as point A on the first graph below.

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d. **How much utility do you earn from the optimum bundle (point *A*)? (1 point)**

$$
\begin{aligned}
u(D, W) &= DW \\
u(20, 15) &= 20 * 15 \\
u(20, 15) &= 300
\end{aligned}
$$

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e. **Now suppose the price of Drinks (D) *rises* to \$4.00. Find the equation of the *new budget constraint* (in *graphable* form), and add it to the first graph below. (3 points)**

$$
\begin{aligned}
4D + 4W &= 120 \\
4W &= 120 - 4D \\
W &= 30 - D
\end{aligned}
$$

See new dotted red line on first graph below.

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f. **Calculate the *new optimum* quantities of x and y under this new price. Plot this point on the first graph below, (call it point *B*), and sketch an indifference curve through that point. Hint: the formula for MRS has not changed. (6 points)**

g. **How much utility do you earn from the new optimum bundle (point *B*)? (1 point)**

$$
\begin{aligned}
u(D, W) &= DW \\
u(15, 15) &= 15 * 15 \\
u(15, 15) &= 225
\end{aligned}
$$

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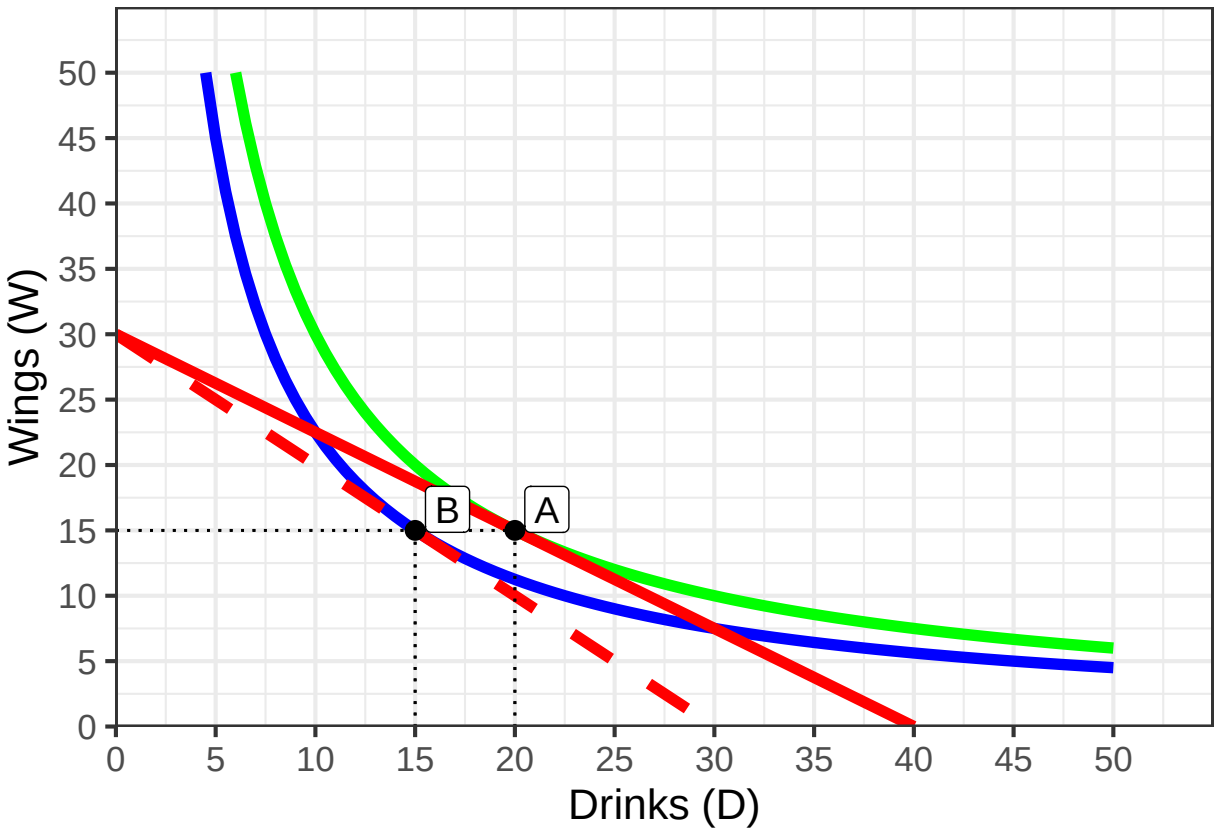
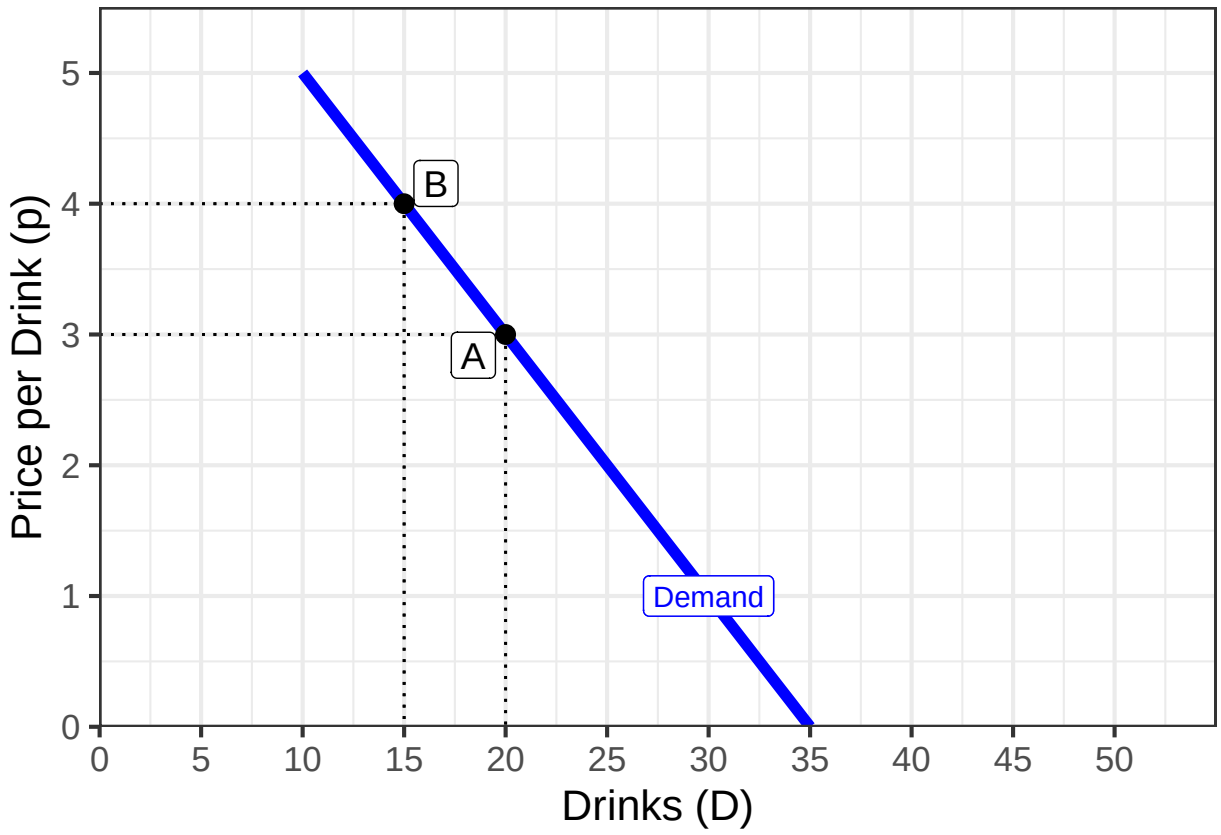
h. **Plot the optima from parts c and f on the *second* graph below, describing the relationship between the price of Drinks and the optimal consumption of Drinks. Connect the points. What did you just draw? (3 points)**




Price per Drink (p)
Drinks (D)
B
A
Demand
0
1
2
3
4
5
0
5
10
15
20
25
30
35
40
45
50