

Problem Set 03

Instructions: Answers must be submitted online through the designated Canvas assignment. This Problem Set is due on **November 04 at 01:59pm**. Please write as legible and clearly as possible. You will not be given full credit if your answers cannot be easily understood.

Questions

Variable	No Tariff	+ Tariff on Final Good	+ Tariff on Input Good
Price of Domestic Final Good	2220	2,775	2,775
Value of Imported Inputs	670	670	750
Domestic Value-Added	1550	2,105	2,025
Effective Rate of Protection, %	0	35.8	30.65

1. [10 points] Complete the table above and express the effective rate of protection in **each case**. Tariffs on the final good are 25% and tariffs on the input good are 12%. Show your work in the space provided below

Final Good Tariff

$$\text{Price of Final Good} \Rightarrow 2200 \cdot 1.25 = 2775$$

Value of Imported Good does not change

$$\text{Domestic Value Added} \Rightarrow 2775 - 670 = 2105$$

$$\text{Effective RP} \Rightarrow \frac{2105 - 1550}{1550} = 35.8$$

Input Good Tariff

Price of Final Good does not change

$$\text{Value of Imported Good} \Rightarrow 670 \cdot 1.12 = 750$$

$$\text{Domestic Value Added} \Rightarrow 2775 - 750 = 2025$$

$$\text{Effective RP} \Rightarrow \frac{2025 - 1550}{1550} = 30.65$$

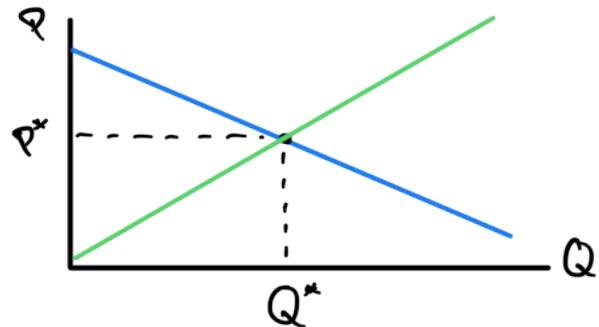
2. [11 points] Suppose we are in an autarky scenario and considering the market for an imported good at Home. Use the following demand and supply functions for solving the various equilibrium scenarios:

$$\text{Demand: } P = 120 - \frac{4}{7}Q_d$$

$$\text{Supply: } P = \frac{1}{4}Q_s$$

Consider the **Autarky Scenario** first

- (a) [3 points] Sketch the supply and demand curves, with the appropriate labeling for the equilibrium point and surplus regions.



- (b) [5 points] Report the coordinates of the equilibrium point, which represent the **price and quantity the market operates at**.

$$\text{Demand} = \text{Supply}$$

$$120 - \frac{4}{7}Q = \frac{1}{4}Q$$

$$120 = Q \left(\frac{1}{4} + \frac{4}{7} \right)$$

$$120 = \frac{\frac{7+16}{28}}{Q}$$

$$120 = \frac{23}{28}Q$$

$$Q^* = \frac{120 \cdot 28}{23} = 146.09$$

Plug Q^* into any fn.

$$P^* = \frac{1}{4}(146.09)$$

$$P^* = 36.52$$

- (c) [3 points] Calculate the consumer and producer surplus values under autarky. What is the total welfare for the economy?

$$CS = \frac{1}{2} [120 - 36.52] \cdot 146.09$$

$$CS = \frac{1}{2} [83.48] \cdot 146.09$$

$$CS = 6097.797$$

$$PS = \frac{1}{2} [36.52 - 0] \cdot 146.09$$

$$PS = \frac{1}{2} (36.52) \cdot 146.09$$

$$PS = 2667.60$$

Welfare is

$$CS + PS$$

$$= 8765.397$$

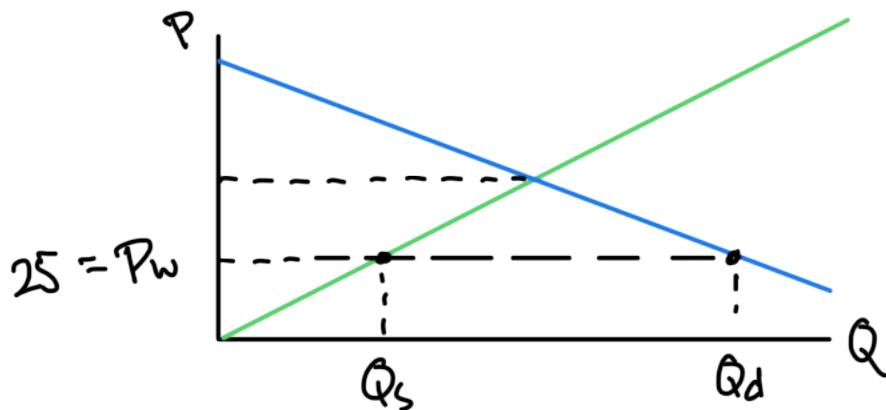
3. [11 points] Using the same demand and supply functions as before, answer the following:

$$\text{Demand: } P = 120 - \frac{4}{7}Q_d$$

$$\text{Supply: } P = \frac{1}{4}Q_s$$

Suppose Home opens up to **free-trade** and becomes exposed to a world price, $P_w = 25$. Be sure to complete every part.

- (a) [3 points] Sketch the market with the **new price line** and corresponding equilibria points for quantity demanded and supplied.



- (b) [5 points] Calculate the equilibrium values for quantities, imports, and surplus values.

Find Q_d, Q_s at new P_w

Demand

$$25 = 120 - \frac{4}{7}Q_d$$

$$\frac{4}{7}Q_d = 120 - 25$$

$$\frac{4}{7}Q_d = 95$$

$$Q_d = \frac{95 \cdot 7}{4} = 166.25$$

Supply

$$25 = \frac{1}{4}Q_s$$

$$100 = Q_s$$

$$CS = \frac{1}{2}(120 - 25) \cdot 166.25$$

$$CS = \frac{1}{2}(95) \cdot 166.25 = 7896.88$$

$$PS = \frac{1}{2}(25 - 0) \cdot 100$$

$$PS = \frac{1}{2}(25) \cdot 100 = 1250$$

- (c) [3 points] What is the change in welfare, relative to **autarky**

Autarky Welfare = 8765.397

Free-trade Welfare = 7896.88 + 1250 = 9146.88

Change is $9146.88 - 8765.397 = 381.483$

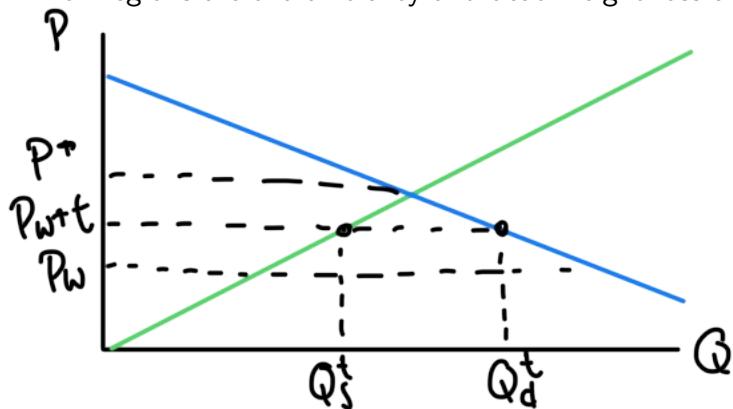
4. [11 points] Using the same demand and supply functions as before, answer the following:

$$\text{Demand: } P = 120 - \frac{4}{7}Q_d$$

$$\text{Supply: } P = \frac{1}{4}Q_s$$

Consider the case in which **the government intervenes, setting a tariff rate of $t = 4$** . Be sure to complete every part.

- (a) [3 points] Sketch the updated demand & supply curves. Label it properly and highlight which regions are the efficiency and dead-weight loss areas



- (b) [5 points] Calculate the equilibria for **quantity supplied, quantity demanded, imports, and surpluses (consumer, producer, government)**.

<u>Supply</u> $2S + 4 = \frac{1}{4}Q_S$ $29 = \frac{1}{4}Q_S$ $116 = Q_S$	<u>Imports</u> $= Q_D - Q_S$ $= 159.25 - 116$ $= 43.25$	$CS = \frac{1}{2}[91] \cdot 159.25 = 7,245.88$ $PS = \frac{1}{2}[29] \cdot 116 = 1,682$ $\text{Govt} = t \cdot \text{imports} = 4 \cdot 43.25 = 173$
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<u>Demand</u> $29 = 120 - \frac{4}{7}Q_D$ $4/7Q_D = 120 - 29$ $4/7Q_D = 91$	$Q_D = \frac{91 \cdot 7}{4}$ $Q_D = 159.25$
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- (c) [3 points] What is the **change in welfare**, relative to free-trade?

$$\begin{aligned} \text{Total Welfare w/ Tariff} &= CS + PS + \text{Gov't Revenue} \\ &\hookrightarrow 7245.8 + 1682 + 173 = 10955.8 \end{aligned}$$

$$\text{Change in Welfare} \Rightarrow 10955.8 - 8765.397 = 2190.40$$