Calculation Question for Relative Supply and Relative Demand Curves

The first part of this exercise, Variation I, is pretty straightforward, and everyone should be able to do it without too much difficulty. Variations II and III are much harder, so for these, hints are provided! Try doing the problems without looking at the hints.

Let us use the supply side from the lectures:

<table>
<thead>
<tr>
<th></th>
<th>Home</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit labor requirement, Beer</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Unit labor requirement, Spam</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Labor supply</td>
<td>1000</td>
<td>2000</td>
</tr>
</tbody>
</table>

Before you get started, write out the equation for the PPFs for Home and for Foreign. You will need to use these equations to answer Variations II and III.

**Variation I:** Suppose we know that the Relative Demand for Spam is related to the Relative Price of Spam according to the following equation:

\[
\frac{P_S}{P_B} = 10 - 14 \frac{Q_S + Q_S^*}{Q_B + Q_B^*}.
\]

A. What is the equilibrium world price of Spam in terms of Beer?
B. How much Beer and Spam is produced by each country?

**Variation II:** Suppose the relative demand for Spam rises (following the discovery that spam is a better medium for holding back floodwaters during hurricanes than, say, sandbags). The new Relative Demand Curve for Spam is

\[
\frac{P_S}{P_B} = 12 - 14 \frac{Q_S + Q_S^*}{Q_B + Q_B^*}.
\]

A. What is the equilibrium world price of Spam in terms of Beer? Note that it cannot be greater than 4 (Why not?)!
B. At the equilibrium world price, how much Beer and Spam is produced by each country?

**HINT:**

Step 1. What is the highest possible value for \(P_S/P_B\)? Plug that into the RD equation.
Now you have an equation that determines \(\frac{Q_S + Q_S^*}{Q_B + Q_B^*}\). Next you will have to use this equation to figure out what quantities of both goods are produced by Home and Foreign.
Step 2. At the equilibrium price, one of the countries will specialize in producing one of the goods. Figure out which one, and substitute zero for the good the country does not produce and the specialization amount for the good the country does produce. You should still be using the RD equation from Step 1.

Step 3. The amounts the other country produces will be determined by the country’s PPF. Use the equation for the PPF to substitute out for one of the remaining quantities. Then solve for the other one.

If you try this, you can email me to get the numerical answers!

**Variation III:** The hurricanes pass, and then new research in a major medical journal finds that people who eat Spam are 10 times more likely to get the really bad form of West Nile virus than the people who never touch Spam. The new Relative Demand Curve for Spam is

\[ \frac{P_S}{P_B} = 8 - 14 \frac{Q_S + Q_S^*}{Q_B + Q_B^*}. \]

A. What is the equilibrium world price of Spam in terms of Beer? Note that it cannot be smaller than 2 (why not?)!
B. At the equilibrium world price, how much Beer and Spam is produced by each country?

Follow procedure for Variation II, this time making use of the fact that the world price of Spam cannot fall below a certain level.