1. We do the problem in the order of the hints given above (though of course you can do it in any order you want).

(a) To find the autarkic equilibrium in Region 1, set demand equal to supply and solve for price:

\[ 62 - 3p_1 = 20 + 5p_1 \]
\[ 42 = 8p_1 \]

So \( p_1^E = \frac{42}{8} = 5.25 \)

(b) Do the same thing in Region 2:

\[ 42 - 5p_2 = 26 + p_2 \]
\[ 16 = 6p_2 \]

So \( p_2^E = \frac{16}{6} = \frac{8}{3} \approx 2.6667 \)

(c) Trade moves from the low-autarkic-price region to the high-price region. Given our conclusions, this means that Region 1 is the importer and Region 2 is the exporter.

(d) For the importing region, excess demand is \( D - S \), so

\[ ED(p_1) = 62 - 3p_1 - (20 + 5p_1) \]
\[ = 42 - 8p_1 \]

You can check that this is reasonable by recalling that excess demand at the autarkic price should be zero: so try \( 42 - 8 \times 5 = 0 \), as expected.

(e) For the exporting region, excess supply is \( S - D \), so

\[ ES(p_2) = 26 + p_2 - (42 - 5p_2) \]
\[ = 6p_2 - 16 \]

Again, excess supply should be zero at the autarkic price, so plug in (and remember that there’s some rounding involved in converting \( \frac{8}{3} \) to 2.6667) and find: \( 6 \times 2.6667 - 16 \) which is essentially zero.

(f) The equilibrium price condition states that in equilibrium the wedge between the exporting region’s price and the importing region’s price is exactly equal to the transport cost \( k \). For our regions this means that

\[ p_1 - p_2 = k \]

or

\[ p_1 = k + p_2 \]

(g) To find the equilibrium, first set up the trade balancing equation: this is just the condition that excess supply and excess demand are equal, so in equilibrium

\[ 42 - 8p_1 = 6p_2 - 16 \]

Now plus in the equilibrium price condition:

\[ 42 - 8(k + p_2) = 6p_2 - 16 \]
and solve the unknown price, here $p_2$:

\[
\begin{align*}
42 - 8k - 8p_2 &= 6p_2 - 16 \\
42 - 8k + 16 &= 6p_2 + 8p_2 \\
58 - 8k &= 14p_2
\end{align*}
\]

(h) Set $k = 1$ in the above expression and find:

\[
58 - 8 = 14p_2
\]

so $p_2 = 50/14. = 3.5714$. Since we know that $p_1 = k + p_2$ we immediately know that $p_1 = 4.5714$.

(i) The equilibrium quantity shipped is found by plugging in to either excess function (both should give the same answer, within rounding). Here I’ll pick the excess demand function in Region 1, so

\[
ED_1(4.5714) = 42 - 8 \times 4.5714 \\
= 42 - 36.5712 \\
= 5.4288
\]

which says that 5.4288 units of whatever-it-was are imported.

(j) How high would the transport cost need to be in order to cost choke off trade? If you look at our picture involving excess demand and supply, clearly trade will be zero if the wedge between the two prices is the distance between the autarkic prices, i.e. $5.25 - 2.6667 = 2.5833$. 

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