Problem set on Malthus model

1) Explain how a Malthusian economy evolves over time in response to the following events. To do this, draw two graphs to describe each event. One graph shows time on the horizontal axis and the real wage on the vertical axis. The other graph shows time on the horizontal axis and the population on the vertical axis. On your graphs, mark the time at which the event occurs as "t_0."

a) There is a one-time improvement in technology.

b) There is a one-time immigration of workers from another country.

c) There is a plague that kills half the population before the people of the country develop resistance to the plague.

d) There is an increase in the "subsistence" real wage that peasants consider necessary to reproduce.

2) Draw scatterplots that show the population on the horizontal axis and the real wage on the vertical axis. Draw in some points that show the combinations of real wages and population that could occur if the economy were occasionally "shocked" by:

a) plagues and wars.

b) improvements in technology

3) A "birth rate" is the number of births in a population, divided by the population. Let b denote the birth rate. A "mortality rate" is the number of deaths in a population, divided by the population. Let d denote the death rate. Consider a Malthusian economy where the birth rate and death rate are both related to the real wage, denoted w, like this:

$b = \kappa_1 + \gamma w$

$d = \kappa_2 - \eta w$

a) In this economy, what is the subsistence real wage σ ?

b) Consider what would happen to this economy if there were an improvement in medical technology which reduced the death rate at any given real wage. How would you describe that event in terms of the two equations for b and d? What would happen to subsistence real wage in the economy?

c) Using the graph we used in class, depict what would happen to the economy if there were an improvement in medical technology which reduced the death rate at any given real wage.