1. To show that the unemployment rate evolves over time to the steady-state rate, let’s begin by defining how the number of people unemployed changes over time. The change in the number of unemployed equals the number of people losing jobs ($sE$) minus the number finding jobs ($fU$). In equation form, we can express this as:

$$U_{t+1} - U_t = \Delta U_{t+1} = sE_t - fU_t = s(L - U_t) - fU_t$$

Dividing by $L$, we get an expression for the change in the unemployment rate from $t$ to $t + 1$:

$$\Delta \left( \frac{U}{L} \right)_{t+1} = s \left(1 - \frac{U_t}{L}\right) - f \frac{U_t}{L} = s - s \frac{U_t}{L} - f \frac{U_t}{L} = s - \frac{(s + f)U_t}{L}$$

Multiplying the right-hand side by ($s + f)/(s + f)$ and rearranging terms to end up with

$$\Delta \left( \frac{U}{L} \right)_{t+1} = (s + f) \left( \frac{s}{s + f} - \frac{U_t}{L} \right) = (s + f) \left( \frac{U^n}{L} - \frac{U_t}{L} \right)$$

Then you can see that, when the unemployment rate is lower than the natural unemployment rate, $(\frac{U^n}{L})$, the change of the unemployment rate will be positive which in turn increases the unemployment. If the unemployment is higher than the natural rate, then the change of the unemployment rate will be negative thus the unemployment rate will decrease. Therefore, wherever the unemployment locates, it will move to its steady state in long run.

2. Treating the uninvolved rate as the unemployment rate (as thinking your girlfriend/boyfriend is your boss), you can use the formula in the text. Steady-state uninvolved rate equals to the percentage of breakups divide the sum of the percentage of breakups and the percentage of newly involved relationships. Then you will get the number $2/3$ from $10/(10+5)$.

3. Consider the formula for the natural rate of unemployment: $U/L = s/(s+f)$. If the new law lowers the chance of separation $s$, but has no effect on the rate of job finding $f$, then the natural rate of unemployment falls.

For several reasons, however, the new law might tend to reduce $f$. First, raising the cost of firing might make firms more careful about hiring workers, since firms have a harder time firing workers who turn out to be a poor match. Second, if searchers think that the new legislation will lead them to spend a longer period of time on a particular job, then they might weigh more carefully whether or not to take that job. If the reduction in $f$ is large enough, then the new policy may even increase the natural rate of unemployment.