Chapter 7, question 8

a) To find output per worker $y$ we divide total output by the number of workers:

$$
\frac{Y}{L} = \frac{K^a [(1-u)L]^{1-a}}{L}.
$$

$$
y = \left(\frac{K}{L}\right)^a (1-u)^{1-a}
$$

$$
y = k^a (1-u)^{1-a}
$$

where the final step uses the definition $k = \frac{K}{L}$. Notice that unemployment reduces the amount of output per worker for any given capital-labor ratio because some of the workers are not producing anything.

The steady state is the level of capital per worker at which the increase in capital per worker from investment equals its decrease from depreciation and population growth (see Chapter 7 for more details).

$$
sy = (\delta + n)k
$$

$$
 sk^a (1-u)^{1-a} = (\delta + n)k
$$

$$
 k^* = (1-u) \left(\frac{s}{\delta + n}\right)^{\frac{1}{1-a}}
$$

Unemployment lowers the marginal product of capital per worker and, hence, acts like a negative technological shock that reduces the amount of capital the economy can maintain in steady state.

Finally, to get steady-state output per worker, plug the steady-state level of capital per worker into the production function:

$$
y^* = \left(1-u^* \left(\frac{s}{\delta + n}\right)^{\frac{1}{1-a}}\right)^a (1-u^*)^{1-a}
$$
\[
(1 - u^*) \left( \frac{s}{\delta + n} \right)^{\frac{\alpha}{1-\alpha}}
\]

Unemployment lowers steady-state output for two reasons: for a given \(k\), unemployment lowers \(y\), and unemployment also lowers the steady-state value \(k^*\).

b) As soon as unemployment falls, output jumps up from its initial steady-state value. The economy has the same amount of capital (since it takes time to adjust the capital stock), but this capital is combined with more workers. At that moment the economy is out of steady state: it has less capital than it wants to match the increased number of workers in the economy. The economy begins its transition by accumulating more capital, raising output even further than the original jump. Eventually the capital stock and output converge to their new, higher steady-state levels.

Chapter 3, question 8 – Suppose that an increase in consumer confidence raises consumers’ expectations about their future income and thus increases the amount they want to consume today. This might be interpreted as an upward shift in the consumption function. How does this shift affect investment and the interest rate?

If consumers increase the amount that they consume today, then private saving and, therefore, national saving will fall. We know this from the definition of national saving:

\[
\text{National Saving} = \text{[Private Saving]} + \text{[Public Saving]} = [Y - T - C(Y - T)] + [T - G].
\]

An increase in consumption decreases private saving, so national saving falls.

Chapter 3, question 12 – If consumption depended on the interest rate, how would that affect the conclusions reached in this chapter about the effects of fiscal policy?

In this chapter, we concluded that an increase in government expenditures reduces national saving and raises the interest rate; it therefore crowds out investment by the full amount of the increase in government expenditure. Similarly, a tax cut increases disposable income and hence consumption; this increase in consumption translates into a fall in national saving—again, it crowds out investment by the full amount of the increase in consumption.
If consumption depends on the interest rate, then these conclusions about fiscal policy are modified somewhat. If consumption depends on the interest rate, then so does saving. The higher the interest rate, the greater the return to saving. Hence, it seems reasonable to think that an increase in the interest rate might increase saving and reduce consumption.