Instructions: This is a closed notes and readings exam. You should provide explanations for each of your answers. Grading will be based on the explanations.

1. Answer each of the following:
   
a. Define the natural rate of interest and explain how a fiscal expansion affects it.

b. Why might current inflation depend on expected future inflation?

c. How are long-term interest rates related to short-term and expected future short-term interest rates?

d. How are real and nominal interest rates related?

2. Some economists suggest that monetary policy in the 1970s targeted the short-term interest rate but that the response of the interest rate to inflation was too small. Follow these steps to explain this argument:
   
a. Write down a Taylor rule and note how inflation affects the interest rate set by the Fed.

b. Suppose expected inflation suddenly rises. How does this affect current inflation?

c. Use the IS-MP diagram to show how the short-term real interest rate responds to this shock (you may use equations if you like). If the Fed’s response to inflation is small, does the real interest rate rise or fall?

d. If the real interest rate falls, does the inflation rate continue to rise? Why?

In the next two questions, we compare two ways to think about how OPEC price increases affect the US economy.

3. For this question, assume an oil price rise increases the mark-up of prices over wages. The economy starts in medium-run equilibrium.

   a. Does the natural rate of unemployment change? Does potential output change?

   b. Does the natural rate of interest change?
c. How do output and inflation change in the short run if the Fed keeps the money supply growth rate constant?

d. How do output and inflation change in the short run if the Fed instead uses a Taylor rule?

4. For this question, assume the oil price increase does not change the mark-up but affects the economy by increasing the value of US imports.

a. Show how the increase in imports affects the IS curve and explain. Does potential output change in this case? Does the natural rate of interest change?

b. How does aggregate demand change with the oil shock?

c. How do output and inflation change in the short run if the Fed keeps money supply growth constant?

d. How do output and inflation change in the short run if the Fed uses a Taylor rule?

5. The economy is in the medium run, and productivity growth suddenly rises.

a. Does potential output rise? Do consumption and investment demand rise?

b. Does the natural rate of interest change? Show how aggregate demand shifts.

c. At constant inflation, how does the productivity increase affect the output gap?

d. The central bank targets the inflation rate at 2%. How does short-run output respond to the productivity rise under this policy.

e. (tough question) Explain why your answer to d. does not depend on whether the productivity increase is expected or unexpected.