I. Suppose that the Phillips Curve is given by \( \pi_t - \pi_t^e = .08 + .2\mu - 2u_t \). The markup over wage costs expressed as a fraction (\( \mu \)) is initially 0.2. Owing to military action in Iraq, oil prices rise; the markup over wage costs increases to 0.3 and remains there.

a) What is the initial "natural" rate of unemployment, when \( \mu = 0.2 \)? What does the "natural" rate become when \( \mu = 0.3 \)? Show your calculations. (10 points)

Initial "natural" rate:
\[
\pi = \pi^e + .08 + .2(\mu) - 2u = \pi^e - 2(u - .06)
\]
\[
U_n = 6\%
\]

New "natural" rate:
\[
\pi = \pi^e + .08 + .2(\mu) - 2u = \pi^e - 2(u - .07)
\]
\[
U_n = 7\%
\]

b) Why in the world should the "natural" rate of unemployment increase when the price of oil increases? That is, what is the economic intuition behind the "natural" rate? (10 points)

The real wage must decline when the markup increases. It takes a higher rate of unemployment to get wage setters to accept the lower real wage they have to accept.

c) What measures can the government take to keep the unemployment rate where it was, that is, at the natural rate of unemployment before the oil price shock? (10 points)

i) The government can increase \( G \) or \( M \)

and

ii) The government can decrease \( T \)

d) Suppose that the government succeeds in keeping the unemployment rate at its initial value. Also suppose that inflation is initially 2\% (.02) and that expectations are adaptive: \( \pi_t = \pi_{t-1} \) (the rate of inflation expected each year is the rate of inflation actually experienced in the prior year). Trace the path of inflation in years \( t+1, t+2, \ldots t+5 \). (10 points)

\[
\pi_t = 2\% \quad \quad \pi_{t-1} = 4\% \quad \quad \pi_{t+2} = 6\%
\]

\[
\pi_{t+3} = 8\% \quad \quad \pi_{t+4} = 10\% \quad \quad \pi_{t+5} = 12\%
\]

c) Does your answer to part d make sense? Why or why not? (10 points) \( \text{NO.} \)

The public will continue to expect \( \pi = \pi_{t-1} \) when they experience increasing inflation year after year.
II. Suppose that energy costs fall because of US success in Iraq. Trace the short-run and medium-run impacts of lower energy costs on the US economy. Show all shifts through time on the graphs below and comment on what is happening at each step. You can get fresh graphs if you need them. Be sure to put your name on any additional graph sheets you use. (50 points)
III. **Explain** the economic intuition behind the familiar relations on the facing page. (10 points each part).

a) Why does the real wage increase with output along the wage-setting relation?

b) Why is the real wage constant along the price-setting relation?

c) Why does price rise with output along the short-run aggregate supply curve?

d) Why does output fall when price rises along the aggregate demand curve?

e) Why does the interest rate rise with output along the LM curve?

f) Why does output increase when the interest rate falls along the IS curve?

g) Why is Yo the “natural” rate of output?

h) What can cause the aggregate demand curve to shift?

i) What can cause short-run aggregate supply to shift?

j) What can change the “natural” rate of output and cause medium-run aggregate supply to shift?

(a) \[ Y \uparrow \quad N \uparrow \quad U \downarrow \quad W \uparrow \quad \text{at each } P^e \]

(b) Any increase in \( W \) is immediately marked-up, leaving \( \frac{W}{P^e} = \frac{1}{1+i} \)

(c) \[ Y \uparrow \quad N \uparrow \quad U \downarrow \quad W \uparrow \quad P \uparrow \quad \text{as } YT \text{ is marked-up} \]

(d) \[ P^e \downarrow \quad (M/P) \downarrow \quad i \uparrow \quad I \downarrow \quad Y \downarrow \]

(e) \[ Y \uparrow \quad (M/P)_d \uparrow \quad i \uparrow \quad \text{at each } P \text{ when } M \]

(f) \[ i \downarrow \quad I \uparrow \quad Y \uparrow \]

(g) Yo corresponds to employment at the natural rate of unemployment where wage-setters accept the real wage they have to accept.

(h) AD | G, T, M, Ld, Co, c...

(i) When \( P^e \) changes, \( W \) changes @ each level of unemployment and output.

\[ \rightarrow P \text{ changes by mark-up} \]

(j) \( WS \text{ shift owing to unemployment benefits, etc.} \)

\( PS \text{ shift owing to } \Delta U \text{ or } \Delta A \text{ (productivity)} \)