Problem Set 3 Questions
Due Date – 3/17/03
PLEASE NOTE – When handing in your problem sets, please staple your answer sheets together. Any loose answer sheets will not be graded

I. True/False/Uncertain

1. An increase in the minimum wage would induce a higher unemployment rate unless firms simultaneously charged a lower markup.
True – a higher minimum wage would shift up the WS curve, calling for a higher unemployment rate; one way to counterbalance this effect is for the PS curve to also shift up, and a lower markup would deliver this outcome

2 One possible reason for the higher unemployment rate in Europe (relative to the US) is the greater extent of labor unionization in Europe.
True – the effect of greater unionization will show up through a larger value of the parameter z, and therefore an upward shift in the WS curve, and consequently a higher equilibrium unemployment rate.

3 The downward sloping nature of the Aggregate Demand curve is a natural example of the law of demand – consumers will demand less at higher prices.
False – the law of demand has no money balances channel, which is crucial in explaining why the AD curve slopes downward.

4 The AD curve is flatter the higher is the interest-responsiveness of investment demand.
True – since a given increase in real balances will lead to a larger increase in equilibrium output, the higher is the sensitivity of investment demand to movements in the interest rate.

5 The IS-LM analysis (from chapters 3-5) corresponds exactly to a situation where the Aggregate Supply curve is horizontal.
True – this is what it means to say that price elasticity is infinite, or that supply is demand-determined, or equivalently, that prices can be held constant, which is the assumption at the heart of the IS-LM analysis in chapters 3-5.

II. The Supply Side

1) The WS curve is given by
$$W/P = 1 - 10u$$
and the PS curve by
$$W/P = 1/2$$
Clearly, the real wage can be read off from the PS curve alone, and is 0.5. To get the equilibrium u, just substitute out W/P from these equations, to get u=0.05.

The natural level of output is given by
$$0.05 = (1000 - Y_N)/1000$$
which gives $Y_N = 950$.

2). First substitute W out from the WS and PS curves, next write u as a function of Y, and use the resulting two equations to obtain the AS curve as
$$500P = P^e(10Y - 9000)$$

3) If $Y = YN$, $P = P^e$ – but this is exactly the definition of the natural level of output, i.e., that output level which corresponds to the natural rate of unemployment, which in turn is the rate of unemployment at which there are no expectational errors.

4)
(a) AS curve translates out and becomes steeper – an increase in the markup has two effects; firstly, at each output level, price increases, and this explains the translation; secondly, a higher price is required to induce production of an extra unit of output (we say that the marginal revenue increases), and this explains the steepening.

(b) AS curve translates up – the reason is that an increase in unemployment benefits increases the nominal wage that workers can negotiate, and therefore increases the price at each output level.

(c) AS curve becomes steeper – the reason is that a small decrease in unemployment (equivalent to a small increase in output) now leads to a larger nominal wage increase, and therefore a larger price increase.

III. The Demand Side
Simply eliminate i from the two equations to obtain one equation in output (actually output demanded) and prices. The slope at any point (Y, P) is given by

$$-\frac{M}{P^2} \frac{1}{\dfrac{m_1}{a_2}(1 - c_1 - a_1) + m_0}$$

It is easily verified from the expression that the AD curve is flatter
(a) the lower is m_1
(b) the higher is c_1

The intuition is that slope of the AD curve captures the following effect – a decrease in prices will
   (1) increase real balances, which
   (2) reduces the interest rate, which
   (3) calls forth investment, and which
   (4) therefore increases output.

The AD curve will be flatter whenever one (or more) of these channels is stronger (meaning the change is larger)

(a) captures the channel described by (1)-(2) – an increase in real balances will necessitate a larger reduction in the interest rate whenever money demand is not very sensitive to the interest rate. This is because the larger money supply can only be willingly held if the interest rate falls, but since money demand is not very responsive to the interest rate, the interest rate will need to fall by a greater amount to restore money market equilibrium. On the other hand, (b) captures the channel described by (4) – an increase in investment will lead to an increase in output, but this output increase will give rise to further spending, so that the multiplier springs into action, and the total increase in output described by (4) will be the combined effect of the investment increase and the multiplier. It follows then that a larger multiplier will increase output by more, but that is what a higher c_1 implies.

IV. Demand and Supply together – see attached diagrams

Expansionary monetary policy – the increase in money supply increases real balances, shifting both the AD and LM curves to the right. The short run impact is thus a fall in interest rates and thus an increase in output above the natural level. And therefore also an increase in the price level. But prices are now not equal to expected prices. As expected prices adjust slowly, the AS curve shifts to the left – prices increase slowly, and this reduces real balances, thus shifting the LM to the left as well. The associated increase in interest rates reduces output, and finally, the economy is back at the natural level of output, at the pre-shock level of real balances (prices having increased in proportion to the increase in money supply) and the pre-shock level of interest rates.

Increase in markup – the increase in the markup causes the AS curve to shift to the left, output falls and prices increase. Once again, workers' expectations are proved wrong, and as expectations slowly adjust, the AS curve shifts even further to the left, increasing prices and lowering output even further, until finally, the economy is in new medium run equilibrium, with expectations having fully adjusted, and output at a new lower natural level. The labor market counterpart of this lower natural level of output is a higher natural rate of unemployment, which is what we would expect from the increase in markup anyway, since the PS curve shifts down.