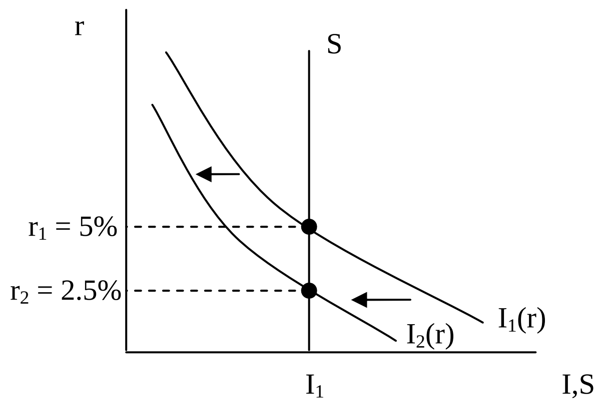
1.

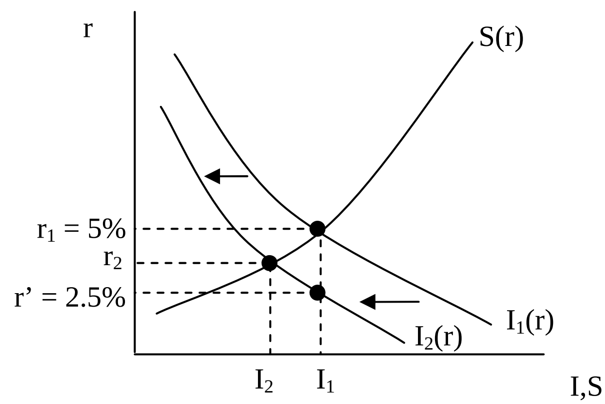
a) $1650 = 200 + 0.6(1650 – 150) + 350 – 2000r + 250$
$-50 = 2000r$
$r = 0.025 \Rightarrow$ **$r = 2.5\%$**

C $= 200 + 0.6(1650 – 150) =$ **1100**
I $= 350 – 2000(0.025) =$ **300**
C and I are unaffected because r adjusts to keep investment constant in the financial market.

b) **S_g** $= T – G =$ **-100**
S_p $= Y – C – T = 1650 – 1100 – 150 =$ **400**
S $= S_g + S_p = -100 + 400 =$ **300 = I**
Private, public, and total savings are unchanged.

c) A decrease in business confidence causes the investment function to shift to the left. As mentioned above, the supply of funds in the financial market is fixed by savings, and remains unchanged. This implies that investment is unchanged because S = I. See the diagram on the left below.





d) Investment will fall because savings responds to the interest rate. Notice that the decrease in the interest rate induces individuals to save less, making fewer funds available for investment. See diagram on the right above. The interest rate will not fall as low enough to keep investment constant. It will fall less than it did in part a).

e) This observation corresponds to the assumption in d) because it implies that individuals decrease their consumption (increase their savings) when the interest rate increases. Alternatively, it would imply when the interest rate falls, individuals respond by increasing their consumption and saving less.

2.

a) Let y = Y/L and k = K/L.
$Y = K^{1/2}L^{1/2}$
$Y/L = (K/L)^{1/2}(L/L)^{1/2}$ Note that $L = L^{1/2} L^{1/2}$
$y = k^{1/2}$

b) $\Delta k = 0 \Rightarrow$ savings = investment, or $\mathbf{sf(k^*) = (\delta + n)k^*}$

country A:
$(0.2)\ k^{1/2} = (0.07 + 0.03)k$
$2 = k/k^{1/2}$
$2 = k^2$
$\mathbf{k^* = 4}$
$y = k^{1/2} \Rightarrow y^* = (4)^{1/2} \Rightarrow \mathbf{y^* = 2}$

country B:
$(0.3)\ k^{1/2} = (0.07 + 0.03)k$
$3 = k/k^{1/2}$
$3 = k^2$
$\mathbf{k^* = 9}$
$y = k^{1/2} \Rightarrow y^* = (9)^{1/2} \Rightarrow \mathbf{y^* = 3}$

c) $c^* = (1-s)y^*$

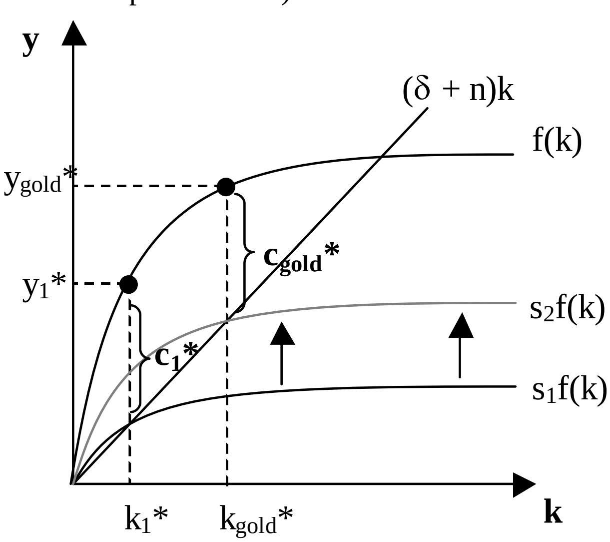
country A:
$c^* = (1- 0.2)(2) \Rightarrow \mathbf{c^* = 1.6}$

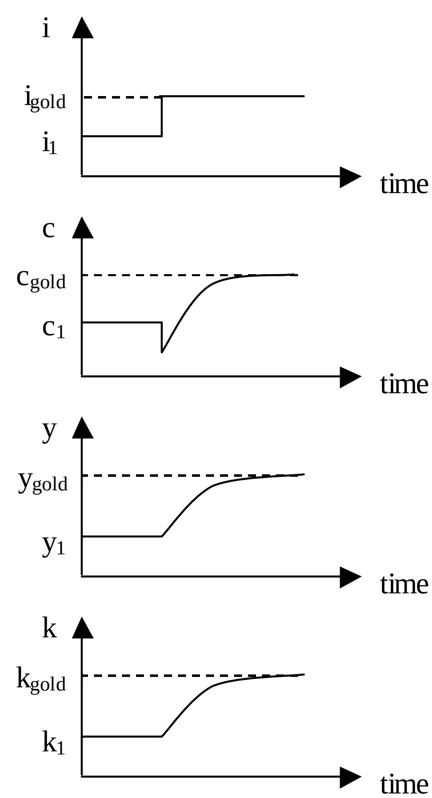
country B:
$c^* = (1- 0.3)(3) \Rightarrow \mathbf{c^* = 2.1}$

d) Since country B has a higher steady state consumption per worker, it must be closer to the golden rule level of capital stock. In the Solow growth model, a higher savings rate (or lower marginal propensity to consume) can lead to higher consumption because there is more output per worker produced. That is, individuals save more, leading to a higher capital stock per worker and more output per worker.

e) In a model with population growth, the golden rule is defined as:
$MPK = (\delta + n)$ Using the hint:
$\frac{1}{2}\ k^{-1/2} = (0.07 + 0.03)$
$\frac{1}{2}\ k^{-1/2} = 0.1$
$k^{-1/2} = 0.2$
$k_{gold} = (0.2)^{-2}$
$\mathbf{k_{gold} = 25}$

f) See diagrams below. When the savings rate increases, consumption falls initially and investment rises immediately. Since investment is increasing, capital is accumulating over time until it reaches its steady state value at k_{gold}. As capital accumulates, output increases, and consumption increases (as output increases) until it reaches its new steady state c_{gold}.





3.

a) In the Solow growth model, the growth in output per capita is constant. Therefore, the disparity should disappear over time, so the two countries will converge in terms of per capital output growth.

b) If China had a higher rate of savings, it would have a higher capital stock per worker, but the growth in per capita output is constant at steady state. While China would have a higher capital and output per worker, the growth rates are constant at steady state. The growth rate in output (Y) is constant in both countries because there is no population growth. Therefore, the answer to part a) would not change.

c) This could not explain the difference in per capita real GDP growth rates because the growth rates are constant at steady state. This could explain the difference in real GDP growth (not in per capita terms) because output (Y) grows at the rate of population growth *(n)* in the Solow growth model (with population growth).

d) This could explain both the difference in growth in output and output per worker. In the Solow growth model with technological progress, per capita output (y) grows at the rate of technological progress and output (Y) grows at the rate $(n + g)$. Since China has a higher g than the U.S., it could explain the divergence in both growth rates.

e) In the endogenous growth model, the growth rates will remain constant at their current level. Therefore, the differences in growth rates can persist over time.

4.

a) Firm profits are maximized when MPL = W/P. Using the hint, it must be true that $2/3\ K^{1/3}L^{-1/3} = W/P$. Solve this equation for L to find the labor demand curve (L as a function of W/P).

$2/3\ (K)^{1/3}L^{-1/3} = W/P$
Substitute in K = 1000:

$2/3\ (1000)^{1/3}L^{-1/3} = W/P$
$2/3\ (10)\ L^{-1/3} = W/P$

You can solve this expression for “L”, but this is not necessary to answer the question.
To solve for L, raise both sides to the power of 3
$(8/27)(10)L^{-1} = (W/P)^3$ Solve for L
$(8/27)\ (10)\ (P/W)^3 = L$
$\mathbf{L = (8/27)}\ (10)\ \mathbf{(W/P)^{-3}}$ **or** $\mathbf{L = 0.296K(W/P)^{-3}}$

b) Using L = 1000 and K = 1000:
$1000 = (8/27)(1000)(W/P)^{-3}$ Cancel the 1000 terms and solve for W/P
$(W/P)^3 = (8/27)$ Take the cubed root of both sides
W/P = 2/3 = 0.667

Employment is L = 1000 (the wage adjusts to make sure that all workers are employed).
$Y = (1000)^{1/3}(1000)^{2/3}$
$Y = (10)\ (100)$
Y = 1000
Total amount earned by workers = (W/P)L = (2/3)1000 = **666 2/3 = 2000/3 = 666.67** (2/3 of output)

c) This wage is higher than the equilibrium real wage. To find how many workers will be hired, use the labor demand function from part a):

$L = (8/27)K\,(W/P)^{-3}$ Substitute in the minimum wage of 1 and K = 1000
$L = (8/27)\,(1000)\,(1)^{-3}$
L = 296 8/27 = 8000/27 = 296.3

Unemployment was zero at the equilibrium real wage, now it increases (only 296 workers are employed).

$Y = (1000)^{1/3}(296)^{2/3} = 10(44.42) =$
Y = 444.15 < 1000 output falls

Total payments to workers = (W/P)L = (1)(296.3) = 296.3 (about 2/3 of output).

The workers who are fortunate enough to keep a job are better off. There are fewer workers employed than before, and they are receiving about 2/3 of output (they are receiving a higher real wage). There are 704 workers who are involuntarily unemployed. Clearly these workers are worse off.

d) Union contracts and efficiency wages.

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5. **NOTE: The material on Question #5 is not required for Exam #1**

a) (1) an open market sale (open market operations)
(2) increase the discount rate
(3) increase the reserve requirement

b) The money supply falls by the same amount. That is, the change in M is **–100.** This is because whatever is issued in currency is held in the form of reserves by banks in a 100% reserve system.

c) The reserve ratio (rr) is equal to reserves divided by deposits (R/D)
rr = R/D
0.05 = R/500
R = 25

M = C + D = 250 + 500 = **750**
B = C + R = 250 + 25 = **275**

d) First, find the currency-deposit ratio (cr) = C/D = 250/500 = 0.5

Now, use the formula for the money multiplier: $\dfrac{(cr+1)}{(cr+rr)} = \dfrac{(0.5+1)}{(0.5+0.05)} = \dfrac{1.5}{0.55} = 2.73$

To find how much M changes, use the relationship between monetary base and money stock:
M = mB Put the equation in terms of changes
$\Delta M = m\Delta B$
$\Delta M = 2.73(-100)$ Notice, it is a cut in B, so it is a negative number.
ΔM = -273

e) They differ because in a fractional reserve system, part of the money deposited gets lent out to other bank customers. That is, banks create money. In a 100% reserve system, the banks do not create money, so the amount issued in currency is the same as what is held at the bank. In a fractional reserve system, there is a multiplier effect because the banks lend out money. When the Fed cuts the money supply, it reduces deposits, and hence, the amount that the bank can lend out. The smaller the reserve requirement, the large the multiplier effects.

6.

a) $\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y$
$9\% + 0 = \%\Delta P + 6\%$
$\boldsymbol{\pi = \%\Delta P = 3\%}$ $\quad$ $\mathbf{r} = i - \pi = 7\% - 3\% = \mathbf{4\%}$

b) $8\% + 0 = \%\Delta P + 6\%$
$\boldsymbol{\pi = \%\Delta P = 2\%}$
Since the classical dichotomy holds, the real interest rate must be unaffected, so **r = 4%** and i = 6%.

c) There are costs associated with both expected and unexpected inflation.
Expected inflation costs include shoeleather costs (individuals have to make more trips to the bank), menu costs (cost for firms associated with posting new prices), taxes (capital gains taxes do not account for inflation), and the inaccuracy of the unit of account.
Unexpected inflation costs include the cost of borrowing (most contracts are denominated nominally, so unexpected inflation hurts lenders) and fixed pensions losing their real value.

d) The Canadian government may not be in favor of cutting inflation because they benefit from seignorage revenue generated by inflation. This is probably not much of a concern for Canada since they have well-developed capital markets. The Canadian government can raise funds by issuing bonds. Loss of seignorage revenue is of bigger concern to emerging markets with poorly-developed capital markets.
