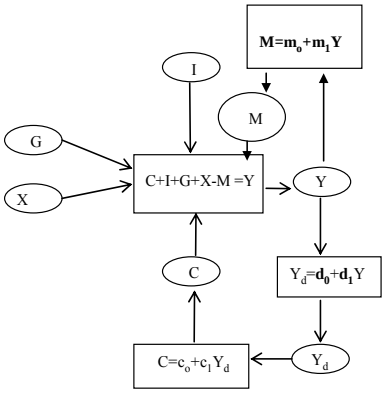
pp 438-440

#1a To convert a variable, such as M into an endogenous variable, we must put the new equation in a box on the graph with an arrow from Y pointing into it and an arrow from the box pointing to the GDP identity. We leave X, standing alone, pointing into Y.



Flow chart rules: One box for each equation; one oval for each variable. No arrows into exogenous variable ovals. At least one arrow into each endogenous variable oval. At least one arrow out of each equation box.

#1b $Y = c_0 + c_1(d_0 + d_1Y) + I + G + X - (m_0+m_1)Y$
$(1-c_1d_1+m_1)Y = c_0 + c_1d_0 - m_0 + I + G + X$
$Y = [1/(1-c_1d_1+m_1)](c_0 + c_1d_0 - m_0 + I + G + X)$ - this is the reduced form equation

#1c $dY/dG = 1/(1-c_1d_1+m_1)$
Note: because of the leakage of spending in imports, the multiplier is smaller than when imports were exogenous.

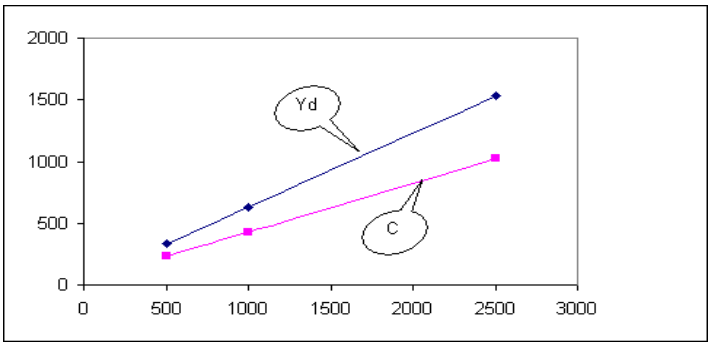
#1d $\partial Y/\partial d_0 = + c_1/(1-c_1d_1+m_1)$ is the tax *cut* multiplier, obtained by differentiating the reduced form equation.

If an increase in government spending is matched by a change in the personal income tax law providing for a tax hike, both equal to 10, then
$[\partial Y/\partial G - \partial Y/\partial d_0] \times 10 = 10\times[(1-c_1)/(1-c_1d_1+m_1)]$
The expression in brackets is sometimes called the "balance budget multiplier." It equals unity if $d_1 = 1$.

#2,

Table 9.9 Consumption and GDP in Simple Land

Y	T	R	D	Tr	Yd	C=30 +.4Y
500	100	25	50	5	330	230
1000	225	50	100	5	630	430
2500	600	125	250	5	1530	1030



Sorry, but I should have specified "$C = a_0 + a_1Y$ (Consumption as a function of GDP)" on page 440 of the text.

$C = 10 + 2/3Y_d = 10 + (2/3)(30 + .6Y) = 30 + 0.4Y$ (i.e., $a_0 = 30$; $a_1 = 0.4$)

$Y_d = Y - T - R - D = Y - (-25 + .25Y) - 0.05\ Y - 0.1Y + 5 = 30 + .6Y$ (i.e., $d_0 = 30$, $d_1 = .06$)

d. Depreciation, corporate retained earnings taxes and transfers create the gap between Y and Y_d.

e. $Y = 30 + 0.4Y + I + G + X - M$

$Y = [1/(1 - 0.4](I + G + X - M)$ ~ This is the reduced form equation (only exogenous variables on the right.)

$\partial Y/\partial G = 1/(1-0.4)$ (The government spending multiplier)

3. Ben Cohen generated with Excel the answers to optional question 3 that are on the next page. Note that the peaks and troughs of this artificial business cycle do not depend upon particular turning point theories, such as banks becoming "loaned up" (running out of reserves) at the cycle peak.

3e.

a) Parameters: c0, c1 = 0.5 and k = 1.1

Period	Government G_t	Consumption $C = c_0 + c_1Y_{t-1}$	Investment $I_t = K^d_t - K_{t-1}$	GDP $Y = C + I + G$	Capital $K_t = K_{t-1} + I_t$	Desired Capital $K^d_t = kY_{t-1}$
0	50.0	50.0	0.0	100.0	80.0	
1	50.0	50.0	30.0	130.0	110.0	110.0
2	50.0	65.0	33.0	148.0	143.0	143.0
3	50.0	74.0	19.8	143.8	162.8	162.8
4	50.0	71.9	-4.6	117.3	158.2	158.2
5	100.0	58.6	-29.2	129.5	129.0	129.0
6	100.0	64.7	13.4	178.1	142.4	142.4
7	100.0	89.1	53.5	242.6	196.0	196.0
8	100.0	121.3	70.9	292.2	266.9	266.9
9	100.0	146.1	54.6	300.7	321.4	321.4
10	100.0	150.3	9.3	259.6	330.8	330.8
11	100.0	129.8	-45.1	184.7	285.6	285.6
12	100.0	92.3	-82.5	109.9	203.2	203.2
13	100.0	54.9	-82.3	72.7	120.9	120.9
14	100.0	36.3	-40.9	95.4	79.9	79.9
15	100.0	47.7	25.0	172.7	104.9	104.9
16	100.0	86.3	85.0	271.4	190.0	190.0
17	100.0	135.7	108.6	344.2	298.5	298.5
18	100.0	172.1	80.2	352.3	378.7	378.7
19	100.0	176.1	8.8	285.0	387.5	387.5
20	100.0	142.5	-74.0	168.5	313.5	313.5

we have a divergent cycle, like fig 9.8 p 479

b) Parameters: c0, c1 = 0.5 and k = 1.0

Period	Government G_t	Consumption $C = c_0 + c_1Y_{t-1}$	Investment $I_t = K^d_t - K_{t-1}$	GDP $Y = C + I + G$	Capital $K_t = K_{t-1} + I_t$	Desired Capital $K^d_t = kY_{t-1}$
0	50.0	50.0	0.0	100.0	80.0	
1	50.0	50.0	20.0	120.0	100.0	100.0
2	50.0	60.0	20.0	130.0	120.0	120.0
3	50.0	65.0	10.0	125.0	130.0	130.0
4	50.0	62.5	-5.0	107.5	125.0	125.0
5	100.0	53.8	-17.5	136.3	107.5	107.5
6	100.0	68.1	28.8	196.9	136.3	136.3
7	100.0	98.4	60.6	259.1	196.9	196.9
8	100.0	129.5	62.2	291.7	259.1	259.1
9	100.0	145.9	32.7	278.5	291.7	291.7
10	100.0	139.3	-13.2	226.1	278.5	278.5
11	100.0	113.0	-52.5	160.6	226.1	226.1
12	100.0	80.3	-65.5	114.8	160.6	160.6
13	100.0	57.4	-45.8	111.6	114.8	114.8
14	100.0	55.8	-3.2	152.6	111.6	111.6
15	100.0	76.3	41.0	217.3	152.6	152.6
16	100.0	108.7	64.7	273.4	217.3	217.3
17	100.0	136.7	56.0	292.7	273.4	273.4
18	100.0	146.4	19.3	265.7	292.7	292.7
19	100.0	132.8	-27.0	205.8	265.7	265.7
20	100.0	102.9	-59.9	143.1	205.8	205.8