1. (a) $r = \left(1 + \frac{APR}{2}\right)^{\frac{1}{6}} - 1$

$= (1 + 0.06)^{\frac{1}{6}} - 1$

$\doteq 0.00976$

(b) $150.000 = \frac{c}{1+r} + \frac{c}{(1+r)^2} + \cdots + \frac{c}{(1+r)^{360}}$

$= \frac{c\left(1 - \frac{1}{(1+r)^{360}}\right)}{r}$

$c = 1509.75$

(c) $150{,}000 = \frac{c}{1+r} + \cdots + \frac{c}{(1+r)^{60}} + \frac{c+1000}{(1+r)^{61}} + \cdots + \frac{c+1000}{(1+r)^{n}}$

$= \frac{c\left(1 - \frac{1}{(1+r)^{60}}\right)}{r} + \frac{(c+1000)\left(1 - \left(\frac{1}{1+r}\right)^{n-60}\right)}{(1+r)^{60} \cdot r}$

$n \approx 146.63$

2. (a) 1-year $P = \frac{FV}{(1+YTM_1)^1} = \frac{1000}{1+0.02} = 980.39$

3-year $P = \frac{FV}{(1+YTM_3)^3} = \frac{1000}{(1+0.04)^3} = 889.00$

5-year $P = \frac{FV}{(1+YTM_5)^5} = \frac{1000}{(1+0.045)^5} = 802.45$

(b) 1-Year $P = FV = 1000$

3-year $P = \frac{FV}{(1+YTM_2)^2} = \frac{1000}{(1+0.03)^2} = 942.60$

5-year $P = \frac{FV}{(1+YTM_4)^4} = \frac{1000}{(1+0.0425)^4} = 846.63$

(c) 1-year $P = FV = 1000$

3-year $P = \frac{1000}{(1+0.035)^2} = 933.51$

5-year $P = \frac{1000}{(1+0.0475)^4} = 830.58$

(d) 1 year $\frac{P_1 - P_0}{P_0} = \frac{1000 - 980.39}{980.39} = 2.0\%$

3 year $\frac{P_1 - P_0}{P_0} = \frac{933.51 - 889.00}{889.00} = 5.0\%$

5 - yr $\frac{P_1 - P_0}{P_0} = \frac{830.58 - 802.45}{802.45} = 3.5\%$

(e) 1 $\frac{P_1 - P_0}{P_0} = \frac{1000 - 980.39}{980.39} = 2.0\%$

3 $\frac{P_1 - P_0}{P_0} = \frac{942.60 - 889.00}{889.00} = 6.0\%$

5 $\frac{P_1 - P_0}{P_0} = \frac{846.63 - 802.45}{802.45} = 5.5\%$

3. 1 year $P = \frac{FV}{1+YTM_1}$

$YTM_1 = \frac{FV}{P} - 1 = \frac{100}{97} - 1 = 3.09\%$

2 year coupon rate = 4% at par

$P = \frac{4}{1+YTM_1} + \frac{4+100}{(1+YTM_2)^2}$

$YTM_2 = 4.02\%$

3 year $P = \frac{4}{1+YTM_1} + \frac{4}{(1+YTM_2)^2} + \frac{104}{(1+YTM_3)^3}$

$YTM_3 = 5.96\%$

4. (a) T

$$W_A = \frac{950}{950+900+850+1200}$$

$$W_B =$$

$$W_C =$$

$$W_D =$$

$$D_p = \sum W_i D_i = \frac{950 \cdot 2.5 + 900 \cdot 7 + 850 \cdot 10 + 1200 \cdot 3.5}{950+900+850+1200}$$

$$= 5.48 > 5$$

(b) T

(i) < (ii) Since $\frac{1}{1+r} + \frac{3}{(1+r)^2} < \frac{2}{1+r} + \frac{2}{(1+r)^2}$ for $r > 0$

$$PV_2 = \frac{2}{1+r} + \frac{2}{(1+r)^2} + \cdots + \frac{2}{(1+r)^n} + \cdots$$

$$= \frac{2}{r} = 40$$

$$PV_3 = \frac{1}{1+r} + \frac{2}{(1+r)^2} + \cdots + \frac{n}{(1+r)^n} + \cdots$$

$$PV_3 \cdot \frac{1}{1+r} = \frac{1}{(1+r)^2} + \cdots + \frac{n-1}{(1+r)^n} + \cdots$$

$$PV_3 \left(1 - \frac{1}{1+r}\right) = \frac{1}{1+r} + \frac{1}{(1+r)^2} + \cdots + \frac{1}{(1+r)^n} + \cdots$$

$$= \frac{1}{r}$$

$$PV_3 = \frac{1}{r\left(1-\frac{1}{1+r}\right)} = \frac{1+r}{r^2} = 110 > PV_2$$

(c) T

$$D = \left(\frac{1 \cdot C}{1+r} + \frac{2 \cdot C}{(1+r)^2} + \cdots + \frac{n \cdot C}{(1+r)^n} + \frac{n \cdot FV}{(1+r)^n} \right) / P$$

$$\leq \left(\frac{nC}{1+r} + \frac{nC}{(1+r)^2} + \cdots + \frac{nC}{(1+r)^n} + \frac{n\,FV}{(1+r)^n} \right) / P = n$$