Assignment for Finance 2

1. Suppose G-Mart's EPS was $3.00 this year, it pays out 40% of its earnings in dividends, and all its investments earn a 15% return. G-Mart has $20 in asset value per share (before accounting for this year's earnings). What is this year's dividend, the new asset value per share, next year's expected dividend, and what is the expected dividend growth rate?

2. A stock sold for $40 one quarter ago, paid a dividend of $0.25 yesterday, and today sells for $41. What was the total rate of return over the quarter, the dividend yield, and the capital gains yield?

3. A stock sold for $30 one quarter ago, had a capital gain yield over the quarter of 10%, and a dividend yield of 1%. What was the size of the dividend, the total return over the quarter, and the selling price immediately after the dividend was paid?

4. Suppose Potter's EPS was $5.00 this year, it pays out 50% of its earnings in dividends, and all its investments earn a 10% return. Potter had $50 in asset value per share (before accounting for this year's earnings). What is this year's dividend, the new asset value per share, next year's expected dividend, and what is the expected dividend growth rate?

5. Consider a stock that sold for $40 one quarter ago, had a capital gain yield over the quarter of -10%, and a dividend yield of 2%. What was the size of the dividend, the total return over the quarter, and the selling price immediately after the dividend was paid?

6. Garlic Galore, Inc. just paid a quarterly dividend of $0.30. Future dividends are forecast to grow at 1% per quarter, forever. If the firm's equity cost of capital is 12% EAR, what should be the price of one share of stock?

7. You are the CFO of a firm and have decided to issue an unusual preferred stock. It will have a par value of $50, a maturity of 10 years, and an annual dividend yield of 4%. However, because you anticipate needing to reinvest all sources of capital for the next two years, the first dividend will not be paid until three years from today. If investors use a discount rate of 10% to value the preferred stock, what should be its price today?

8. Consider a 7.8%, 10-year bond selling for $909.73 whose first coupon will be paid six months from now. If its yield to maturity is higher by 1% in six months, what will be the rate of return on the bond over the next six months (right after the first coupon is paid)? (By 1% higher means if the YTM = X% today, then in six months it is X% + 1%). This is an advanced problem that requires some careful, meticulous work.

9. (Text chapter 9 problem 3)

10. Trainlink, Inc. just paid an annual dividend of $0.50. You expect it will pay an annual dividend of $0.65 one year from now, and you expect its dividends after that to grow by 12% per year for four years before growing at a constant 2% per year thereafter. What do you believe the fair price is today if the equity cost of capital is 8%?

11. Your firm expects EPS equal to $4.00 at the end of the year and expects to grow at 35% for two years after that, before slowing to a constant growth rate of 8%. If it maintains a payout ratio of 40% and the cost of equity capital is 14%, what does your firm believe should be the fair value of its stock?

12. (Text chapter 6 problem 1)

13. (Text chapter 6 problem 2)

14. (Text chapter 6 problem 11)

15. Consider a $30 par value share of preferred stock with a 6% dividend rate (paid quarterly), and a 20-year life. The required return is 10% APR (compounded quarterly). Find the fair value of one share.

16. (Text chapter 9 problem 6)

17. Suppose Tim's famous snail burgers just paid an annual dividend of $0.96. You expect the next 4 dividends to grow at 11% per year, and after that at 5.2% indefinitely. If the cost of equity capital is 8.5%, what is the fair price of one share of stock?

18. The management of Cabinets Galore expects EPS at the end of the year to be $1.80, expects EPS to grow at 30% for the three years that follow before slowing to a constant growth of 10%, and maintains a payout ratio of 60%. If their cost of equity capital is 12%, what do they believe should be the fair value of their stock price?

19. (Text chapter 6 problem 6)

20. Suppose you purchase a 10-year bond with 6% annual coupons. You hold the bond for four years, and sell it immediately after receiving the fourth coupon. If the bond's yield to maturity was 5% when you purchased and sold the bond,

    A. What cash flows will you pay and receive from your investment in the bond?
    B. What is the internal rate of return of your investment?

21. Consider a $40 par value share of preferred stock with a 5% dividend rate (paid quarterly), a 10-year life, and a current price of $29.96. Express the required rate of return investors have for this stock as an EAR.

22. Briefly describe the following benchmark rates.
    A. Federal Funds rate
    B. LIBOR
    C. Prime rate
    D. Ten-year Treasury rate

23. Suppose the term structure of risk-free interest rates is as follows:

Term	1 yr	2 yrs	3 yrs	5 yrs	7 yrs	10 yrs	20 yrs
Rate (EAR %)	1.82	2.31	2.65	3.15	3.63	4.02	4.88

A. Calculate the fair price (the present value) of an investment that pays $1000 in two years and $2000 in five years for certain.
B. What is the fair price of a risk-free investment that pays $100 at the end of years 1, 2, and 3?
C. Given that the investment in part b is an annuity, what is the single rate of interest that could be used to value the annuity (e.g., in a financial calculator using the PMT key)?
D. Describe the shape of the yield curve given and what it implies for expectations for future interest rates.

24. Chapter 5, problem 26

25. Chapter 5, problem 37

26. What is the Fisher equation?

27. Suppose the price of a 1-year zero coupon risk-free bond is $952.38 and the price of a two-year zero coupon risk-free bond is $924.56. What is the price of a 7% annual coupon risk-free bond that matures in 2 years?
    a. What is its yield to maturity?
    b. Suppose you expect next year that the 1-year spot rate will be 4.5% and the 2-year spot rate will be 4.7%. What is the one-year holding period return you expect on the bond?

28. Suppose you observe the following term structure:

	Effective Annual YTM
1-year zero-coupon bond	3.1%
2-year zero-coupon bond	3.2%
3-year zero-coupon bond	3.3%
4-year zero-coupon bond	3.4%

A. If you believe that the term structure next year will be the same as todays, will the 1-year or the 4-year zero coupon bonds provide a greater expected 1-year return?
B. What if you believe that next year the YTM on the 1-year zero coupon bond will be 3.0%, that on the 2-year will be 2.8%, that on the 3-year will be 2.6%, and that on the 4-year will be 2.4%?

29. Suppose your marginal tax bracket is 30% for both income and capital gains, and an investment for which you paid $10,000 one year ago has just paid you $500 and now you have sold it for $9,900. If the inflation rate over the year was 4%, what is your one-year after-tax real rate of return?

30. A 1-year zero coupon Treasury bond sells for $988.14 and a 2-year zero coupon Treasury bond sells for $970.66. If you buy a 2-year 5% annual coupon bond today, and one year from now immediately following a coupon the one-year risk-free rate of interest is 1.4%, what will be your realized return?

31. If today's one-year spot-rate (i.e., YTM on a one-year risk-free zero coupon bond) is 4%, the two-year spot rate is 4.5%, and the three-year spot rate is 5.0%, what should be the yield to maturity of a 3-year, 8% annual coupon bond?

FINANCE 2 ASSIGNMENT - SUGGESTED SOLUTIONS

1. This year's dividend D_0 = \$3.00(0.40) = \$1.20 and the retained earnings is thus \$1.80 (which is the \$3.00 EPS minus the dividend paid). The new asset value per share will be \$20 + \$1.80 = \$21.80.

   Applying the investments return of 15%, next year EPS will be 21.80(0.15) = \$3.27.
   Next year's expected dividend is \$3.27(0.40) = \$1.31, so the expected dividend growth rate is 1.31 / 1.20 – 1 = 9.17%.

2. Total rate of return = [(41 + 0.25) – 40] / 40 = 3.125%.
   Dividend yield was 0.25/40 = 0.625%
   Capital gains yield was (41-40)/40 = 2.500%.
   Note that total rate of return = dividend yield + capital gains yield.

3. Dividend yield = div / P_0 , so 0.01 = div/30 ➔ div = \$0.30.
   Total return = dividend yield + capital gain yield = 1% + 10% = 11%
   Capital gain yield = $(P_1 – P_0) / P_0$ so that 0.10 = $(P_1$ - 30)/30 ➔ P_1 = \$33.00

4. This year's dividend D0 = \$5.00(0.50) = \$2.50 and the retained earnings is thus \$2.50 (\$2.50 EPS minus the dividend paid). The new asset value per share will be \$50 + \$2.50 = \$52.50. Applying the investments return of 10%, next year EPS will be 52.50(0.10) = \$5.25. Next year's expected dividend is \$5.25(0.50) = \$2.63, so the expected dividend growth rate is 2.63 / 2.50 – 1 = 5.2%. [Note: the dividend growth rate does not equal the firm's return of 10% x (1 – payout rate) = 10% (1 – 0.50) = 5% only because the dividend of 2.63 was rounded from 2.625…if you use 2.625 then the dividend growth rate would be 5%].

5. Dividend yield = dividend / P_0, so 0.02 = dividend/40 implies dividend = 0.80.
   Total return = dividend yield + capital gain yield = 2% + (-10%) = -8%
   The capital gain yield of -10% equals $(P_1 – P_0)/P_0$, so we have -0.10 = $(P_1$ – 40) / 40 which implies that P_1 = \$36.00.

6. Div_0 = \$0.30 was just paid—the current stock price will be the present value of all *future* dividends and the first will be paid one quarter from now. To use the constant growth model (equation 9.6 in the text), we need Div_1 = 0.30(1.01) and we also need the quarterly periodic discount rate to use for the cost of equity capital r_E, which is found by solving

   $0.12 = (1 + r_{pq})^4 – 1$ ➔ $r_{pq} = 0.02873734$. The stock price should be:

   $P_0 = Div_1 / (r_E – g)$ = 0.30(1.01) / (0.02873734 – 0.01) = \$16.17.

7. The cash flow pattern is as follows:

   PV as of t = 2 (one period before the first payment):
   N = 8, PMT = -2, I = 10, FV = -50 ➔ PV = 33.9952214.
   PV at t = 0 = price = 33.9952214 / $(1.10)^2$ = \$28.10.

8. We need to know the bond price in six months, and, to know this, we need to know the new yield to maturity six months later. Thus, first we find the yield to maturity as of today: PV = -909.73, N = 20, FV = 1000, PMT = 39 (which is 0.078 x 1000 / 2. Remember, we always assume semi-annual coupons unless told otherwise) ➔ I = 4.60% per six months, so that the YTM = 2 x 4.60% = 9.20%.

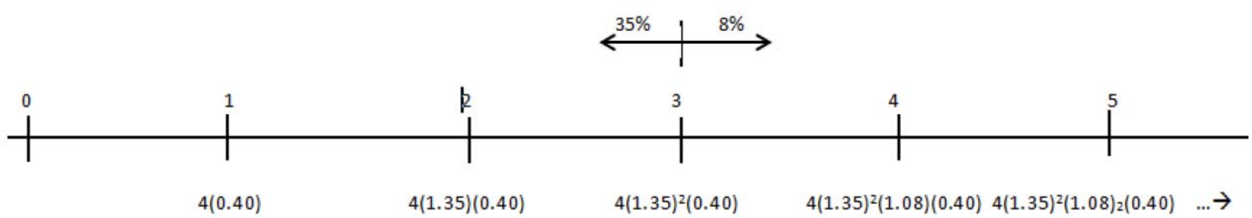
   In 6 months the YTM is 9.20% + 1% = 10.2%, so we solve for the new price as follows (note the value for N is now 19 and I = 10.2 / 2 to use the 6-month rate):
   N = 19, FV = -1000, PMT = -39, I = 5.10 → PV = 856.15
   At t = 6 months you receive the \$39 coupon plus you own a bond worth (i.e., you could sell for) \$856.15. You paid \$909.73 (given in the problem) at t = 0.
   The rate of return is [(856.15 + 39) / 909.73] – 1= -1.60%.

9. PV at t = 0: 2.80 / 1.10 + (3.00 + 52.00) / 1.10^2 = \$48.00
   Expected PV as of t = 1: (3.00 + 52.00) / 1.10 = \$50.00
   PV at t= 0 = (2.80 + 50.00) / 1.10 = \$48.00

10. We ignore the \$0.50 dividend (it was already paid and a new buyer will not receive it!). The first dividend to plug into the constant growth model is D_5, because this is the first dividend after which the 2% growth begins. Note that $D_5 = D_1(1.12)^4 = 0.65(1.12)^4$. The value of D_5, D_6, D_7, etc. as of t = 4 (one period before D_5) is found by applying the constant growth model: $0.65(1.12)^4$ / (0.08 – 0.02) = 17.0464597. The 17.0464597 is valued as of t=4 (it includes D_5 and later but the value is as of t=4), so we add it to the forecasted dividend D4 in the valuation of cash flows as t=1 through t=4.

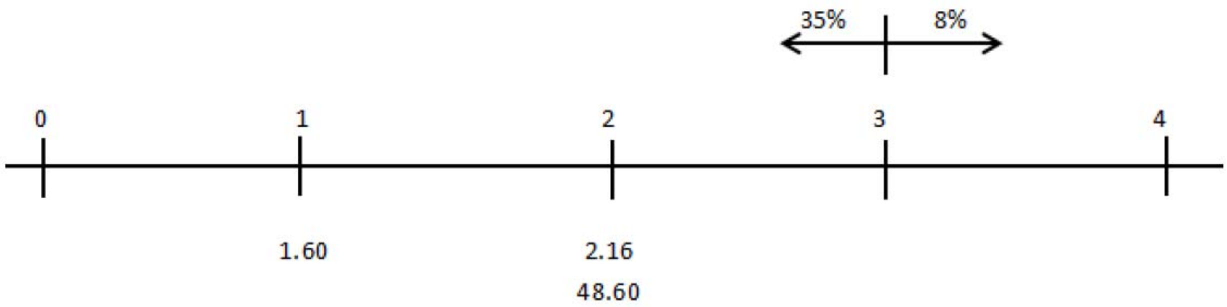
$$P_0 = \frac{0.65}{1.08} + \frac{0.65(1.12)}{1.08^2} + \frac{0.65(1.12)^2}{1.08^3} + \frac{0.65(1.12)^3 + 17.0464597}{1.08^4} = \$15.07$$

11. The cash flow stream of dividends is as follows:



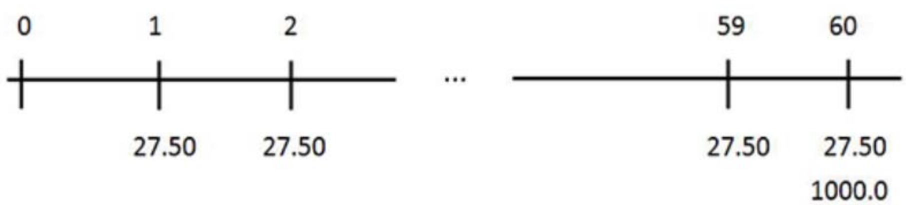
First forecast dividends out to where the growth rate switches (which is t = 4):
Div_1 = 4.00(0.40) = \$1.60
Div_2 = 4.00(1.35)(0.40) = \$2.16
Div_3 = $4.00(1.35)^2(0.40)$ = \$2.916
Next, use the constant growth model and the first dividend after which the slower growth begins (Div_3) to value that and future dividends: 2.916 / (0.14 – 0.08) = \$48.60000. This is valued as of t =2, because the value is given one period before the dividend used. Now we

can view the cash flows to value as follows (putting in the values of Div_1 and Div_2 as well as the 48.60, and note no further cash flows at t = 3 or later):



Thus the price should be $1.60/1.14 + (2.16 + 48.60) / (1.14)^2 = \$40.46$.

12. To find the coupon, we solve Coupon = (Coupon rate x Face value) / # coupons in one year. Thus, the coupon is (0.055 x \$1000) / 2 = \$27.50.
The timeline of the cash flows this bond promises, in terms of 6-month time periods, is as follows:



13. a. Maturity = 10 years
b. (20 x 2) / \$1000 = 0.0400 = 4.00%
c. Face value = \$1000

14. a. Note the "annual payments" so we have n = 10, I = 6, pmt = -70, fv = -1000 ➔ pv = \$1073.60

b. n = 9, I = 6, pmt = -70, fv = -1000 ➔ pv = \$1068.02 = quoted price.
If we buy the bond and immediately receive the first coupon, the invoice price will reflect the first payment (no discounting needed) and the invoice price will thus be \$70 + \$1068.02 = \$1,138.02

c. \$1068.02 (the quoted price from part b)

15. N = 20 x 4 = 80, I = 10/4 = 2.5
Quarterly dividend = pmt = 0.06(30)/4 = 0.45
N=80, I=2.5, PMT = -0.45, FV = -30 ➔ PV = \$19.66.

16. Price = PV at t = 0 = 1.50 / (0.11 – 0.06) = \$30

17. The first dividend to plug into the constant growth model is D_5 , because this is the first dividend after which the 5.2% growth begins. Note that D_1 = 0.96(1.11) because the 0.96

was “just paid”... thus, $D_5 = 0.96(1.11)^5$. The value of D_5 , D_6 , D_7 ... etc. as of t = 4 (one period before D_5) is found applying the constant growth model: $0.96(1.11)^5$ / (0.085 – 0.052) = 49.019874. This, along with D4, needs to be discounted back 4 period to t = 0 and of course we also need to add the discounted values of D_1 through D_3. The complete valuation is as follows:

$$P_0 = \frac{0.96(1.11)}{1.085} + \frac{0.96(1.11)^2}{1.085^2} + \frac{0.96(1.11)^3}{1.085^3} + \frac{0.96(1.11)^4 + 49.019874}{1.085^4} = \$39.44$$

18. D_1 = 1.80(0.60) = \$1.08 and because the payout ratio is constant, we can simply grow dividends from there at the expected growth rates in EPS. The first dividend to plug into the constant growth model is D_4 , because this is the first dividend after which the 10% growth begins. $D_4 = 1.08(1.30)^3$. The value of D_4 , D_5 , D_6 , etc. as of t = 3 (one period before D_4) is found applying the constant growth model: $1.08(1.30)^3$ / (0.12 – 0.10) = 118.63800. The complete valuation is as follows:

$$P_0 = \frac{1.08}{1.12} + \frac{1.08(1.30)}{1.12^2} + \frac{1.08(1.30)^2 + 118.63800}{1.12^3} = \$87.83$$

19. n=20, pmt = 40, fv = 1000, pv = -1034.74 ➔ I = 3.75 so YTM = 2 x 3.75% = 7.5%
n=20, I = 4.5 pmt = 40, fv = 1000,➔ pv = -934.96 (so new price = \$934.96).

20. Note annual coupons. Price you pay: n = 10, I = 5, pmt = -60, fv = -1000 ➔ pv = \$1077.22.

Price when you sell = PV of the remaining payments the buyer will receive, so you sell at N = 6, I = 5, pmt = -60, fv = -1000 ➔ pv = \$1050.76

You pay \$1077.72 today, receive \$60 at t = 1, 2, 3, and 4 years, and receive \$1050.76 from selling.

Simply solve for I as follows: n = 4, pmt = 60, pv = -1077.22, fv = 1050.76 ➔ I = 5.00%. This makes sense because the YTM = 5% both when you bought and when you sold.

21. N= 10x4 = 40, pmt = 0.05(40)/4 = 0.50, fv = 40, pv = -29.96 ➔ I = 2.20% (per quarter)
EAR = (1.022)4 -1 = 9.09468%

22. The Federal Funds rate is the overnight rate the Federal Reserve sets at which member banks in the Federal Reserve system will borrow and lend to meet daily reserves requirements.

LIBOR stands for London Interbank Offered Rate and is estimated by major banks in London as the rate that leading banks would charge each other to borrow and lend. This is the worldwide leading benchmark rate for floating rate situations.

The prime rate is the average rate that U.S. banks charge to their most favored borrowers. It is compiled by the Wall Street Journal.

The ten-year Treasury rate is a 10-year maturity rate based on Treasury securities. It is a widely used benchmark risk-free rate for intermediate maturity situations, including 30-year fixed rate mortgages (few are held anywhere near 30 years!).

23. a. PV = $1000/(1.0231)^2 + 2000/(1.0315)^5$ = \$2,668.06

b. PV = $100/(1.0182) + 100/(1.0231)^2 + 100/(1.0265)^3$ = \$286.20
c. N = 3, PMT = 100, FV = 0, PV = -286.20 ➔ I = 2.39%, which seems very reasonable because it should be some sort of weighted average of the 1-year, 2-year, and 3-year rates from the term structure.
d. This yield curve is upward sloping and therefore implies investors expect future rates to increase.

24. Recall that the real rate (r) and the nominal rate (r) are related based on the inflation rate (i) as follows: $1+r_r = (1+r)/(1+i)$. By algebra, we thus have $r = (1+r_r)(1+i) – 1$. Thus, r = (1.03)(1.05) -1 = 0.0815 = 8.15%. We would need a nominal rate of 8.15%.

25. The after-tax rate the regular savings account pays 5.5% is 5.5%(1 – .35) = 3.575% EAR. The daily rate the money market account pays is 0.0525/365 = 0.000143835616 so that the EAR it pays is $(1.000143835616)^{365}$ -1 = 0.053899 = 5.3899% and the after-tax EAR is 5.3899% (1 – 0.35) = 3.50%. Thus, the regular savings account pays a higher rate.

In the U.S. there is no tax deduction on consumer debt (there used to be, but it was eliminated in the Tax Reform Act of 1986), so the after-tax rates your friend pays on the credit card and car loans are 14.9% APR and 4.8% APR respectively, which exceeds the rate earned on savings. Note the EARs will only be higher than this because compounding within the year means that an EAR exceeds the APR.

EAR of credit card: $(1 + 0.149/12)^{12} – 1$ = 0.159609 = 15.9609%
EAR of car loan: $(1 + 0.048/12)^{12} – 1$ = 0.049070 = 4.9070%

The home equity line charges a pre-tax EAR of $(1+0.05/12)^{12} – 1$ = 5.1161898% and an after-tax EAR of 5.1161898%(1-0.35) = 3.3255%.

Because the rates of interest are higher on the car and credit card loans than on the two savings accounts, your friend should pay off those two loans but not the home equity loan, which has a very low after-tax EAR that is lower than the interest being earned on the two savings accounts.

(As a side comment, this conclusion is purely from an interest perspective – a caveat here is that there is something to be said for having some emergency money that is liquid in the event of unforeseen circumstances, losing one’s job, etc. Depending on your circumstances, you may not be able to rely on the ability to borrow money when you need it the most, but in this case the balance in the savings accounts totals \$130,000 versus only \$15,000 in debt, so it would seem clear it is best to pay off the debt because the reduction in liquid savings would be relatively small relative to the amount left available).

26. The Fisher Equation states that the nominal rate should be equal to the real rate of interest plus the expected inflation rate. Although the evidence does not *strongly* support this, there is some evidence that T-bill rates do roughly fluctuate with inflation.

27. First, find the spot rates (the one- and two-year risk-free rates). The spot rate for the 1-year zero coupon bond is found by solving $1000 / (1+y_1) = 952.38$ ➔ $y_1 = 5.0\%$. The spot rate for the 2-year zero solves $1000 / (1+y_2)^2 = 924.56$ ➔ $y_2 = 4.0\%$.

The price of the bond today is $70/1.05 + 1070 / (1.04)^2 = \$1055.94$.
N = 2, PMT = 70, FV = 1000, PV = -1055.94 ➔ I = 4.033%

Imagine receiving the coupon at t = 1 year and then selling the bond…at that time it will have only the $1070 cash flow left to receive, payable one year later to whomever buys the bond from you. You expect this one year cash flow will thus be valued (as of t = 1) at 1070/1.045 = $1023.92 (this is the expected selling price of the bond at t = 1, immediately following the coupon at that time). Thus you expect a rate of return, given that you paid 1055.94 to buy the bond, of [(1023.92+70)-1055.94]/1055.94 = 3.596%.

28. The 1-year will pay you 3.1% over this year.
Price today of the 4-year bond is $1000 / (1.034)^4 = \$874.82$. You expect that one year later, when it has turned into a 3-year bond, the price will be $1000 / (1.033)^3 = \$907.19$ (because you expect the 3-year rate to be 3.3% at that time). The rate or return you thus expect between today and one year from today is (907.19 / 874.82) – 1 = 3.70%, which is greater than the 1-year bond will earn.

Note today's price (the price you pay) remains $874.25, because you are told nothing about todays' yield curve being different. However, now you expect that one year later when the 4-year bond has turned into a 3-year bond, the price will be $1000 / (1.026)^3 = \$925.89$. The rate of return you thus expect over the year is (925.89 / 874.25) – 1 = 5.907%, which is *much* greater than the 1-year will earn (the 1-year will continue to pay a certain 3.1%).

29. Pre-tax nominal rate of return is [(9,900 + 500) / 10,000] – 1 = 4.0000%. After-tax nominal rate of return is 0.04(1 – 0.30) = 0.028 and the after-tax real rate of return is thus (0.028 – 0.04) / (1.04) = -0.011538 or -1.1538%.

30. Today's 1-year spot rate: (1000/988.14) – 1 = 0.01200235 Today's 2-year spot rate: $(1000/970.66)^{1/2} - 1 = 0.01500091$ Price today = $50/(1.01200235) + 1050/(1.01500091)^2 = \$1068.60$.
Price in one year = 1050/(1.014) = $1035.50.

Realized return (recognizing the coupon income you receive): [(1035.50 + 50) / 1068.60] -1 = 0.015815 or 1.5815%.

31. Price of the bond is $80/(1.04) + 80/(1.045)^2 + 1080/(1.05)^3 = \$1083.13$ YTM: N = 3, PMT = 80, FV = 1000, PV = -1083.13 ➔ I = 4.95%. (Payments are annual, so this is already the YTM. It needs no conversion).