Problems (75 points each)

Note: Unless I specifically state "Calculations required", you can just set up all problems. If you are using the result of an unsolved equation in a later step, just make that clear. One way to do this, set up the equation and call your result "A" or "B", etc. If in any step you are solving for something other than the left-hand side of the equation, indicate which variable you are solving for. If you prefer, you can solve everything (but this will take longer).

1. Dell Storage trades for $350 and will pay off either $300 or $450 one year from today depending on whether the economy is weak or strong. The market index fund trades for $250 and will pay off either $200 or $350 one year from today depending on whether the economy is weak or strong. The risk-free interest rate equals 4%. Set up a table that shows net cash flows will always equal $0 next year and which answers the following questions. Note: Use "+" for inflows and "–" for outflows. Calculations required.
   a. What set of transaction today generates an arbitrage profit?
   b. What arbitrage profit do these transactions create?
   ~~c. Assume the economy is strong a year from today. What transactions are required to unwind your arbitrage trades?~~
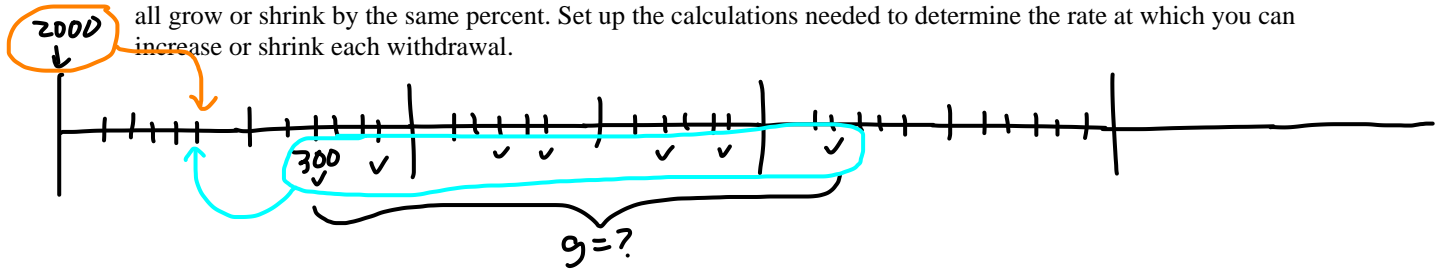
Equivalent to Dell:

	CF_1	
	W	S
Buy mkt	200	350
Buy Treasury	100	100
Total	300	450

Price of Treasury $= \dfrac{100}{1.04} = 96.1538$

Cost of Equivalent portfolio $= 250 + 96.1538 = 346.1538$

$\Rightarrow$ buy portfolio + short sell Dell

			CF_1	
Transact (t=0)	CF_0	W	S	
+9 Short sell Dell	+350 +5	–300 +5	–450 +5	
+9 Buy market	–250 +5	+200 +5	+350 +5	
+9 Buy Treasury	–96.1538 +5	+100 +5	+100 +5	
	+3.8462 +3	Ø	Ø	

2. You have just deposited $2000 into an account earning an APR of 5% with monthly compounding. You plan to begin quarterly withdrawals from this account beginning 8 months from today. Your final withdrawal would occur 2 years and 2 months from today. Your first withdrawal will equal $300 and subsequent withdrawals will all grow or shrink by the same percent. Set up the calculations needed to determine the rate at which you can increase or shrink each withdrawal.
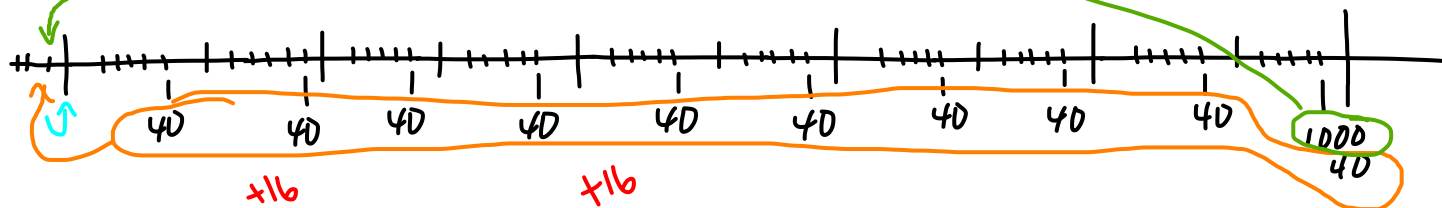
2000

300

$g = ?$

$+22$ $+22$

$$2000\left(1 + r\left(\tfrac{1}{12}\right)\right)^5 = \left(\frac{300}{r\left(\tfrac{1}{4}\right) - g}\right)\left(1 - \left(\frac{1+g}{1 + r\left(\tfrac{1}{4}\right)}\right)^7\right) \Rightarrow \text{set equal \& solve for } g + g$$

$+11 \left/ r\left(\tfrac{1}{12}\right) = \frac{.05}{12}\right.$

$+11 \left(r\left(\tfrac{1}{4}\right) = \left(1 + r\left(\tfrac{1}{12}\right)\right)^3 - 1\right.$

3. A bond that matures four years and 11 months from today for $1000 has a coupon rate of 8%. Coupons are paid semiannually. Set up the calculations needed to determine the clean price of the bond if its yield to maturity equals 6%.

$$V_{-1m} = \left(\frac{40}{r\left(\frac{1}{2}\right)}\right)\left(1 - \left(\frac{1}{1+r\left(\frac{1}{2}\right)}\right)^{10}\right) + \frac{1000}{\left(1+r\left(\frac{1}{2}\right)\right)^{10}}$$

$$V_0 = V_{-1m}\left(1 + r\left(\frac{1}{2}\right)\right)^{1/6}$$

$$\text{clean} = V_0 - \left(\frac{1}{6}\right)40$$

$$r\left(\frac{1}{2}\right) = \frac{.06}{2}$$

$$\text{coupon} = \frac{.08(1000)}{2}$$

4. Slamburger is considering investing $3.75 million today in a new retail store. The new store will fall into the 10-year MACRS class and will be built on land Slamburger acquired a year ago for $250,000. This land could be sold today for an after-tax cash flow of $300,000. Slamburger expects revenues a year from today to equal $60 million. In the following years, sales are expected to grow by 4% per year. Slamburger estimates that variable ~~associated~~ costs be the same as at existing stores and thus will equal 77.5% of revenues that and fixed costs ✓will equal ~~with the~~ $10.5 million per year. Ten percent of the sales of the new Slamburger store would have occurred anyway at ~~store~~ existing stores. Net working capital (in millions) associated with the store will be as follows:

Year	0	1	2	3	4	5
Cash	0.00	3.60	3.87	4.18	4.39	4.35
+ Acct. Receive	0.00	1.95	2.06	2.11	2.24	2.39
+ Inventory	0.00	7.65	8.27	8.87	9.40	9.37
− Acct. Payable	0.00	7.50	7.98	8.16	8.57	8.50

6.22   7

Set up the calculations needed to determine the new store's unlevered net income and free cash flow ~~today and~~ three years from today if Slamburger's marginal tax rate equals 35%.

$$UNI_3 = (R_3 - E_3 - D_3)(1 - .35) \; +14$$

$$R_3 = 60(1.04)^2 \, (1 - .1) \; +11$$

$$E_3 = .775(R_3) + 10.5 \; +11$$

$$D_3 = 3.75(.1440) \; +11$$

$$FCF_3 = UNI_3 + D_3 - CE_3 - \Delta NWC_3 \; +14$$

$$\Delta NWC_3 = 7 - 6.22 \; +11$$

$$CE_3 = 0 \; +3$$

5. Orchid Pharmaceuticals expects earnings of $600 million a year from today. It expects to pay out 25% of its earnings as dividends and expects to pay out 15% of its earnings through repurchases of common stock. Orchid Pharmaceuticals expects earnings to grow by 20% per year through four years from today and by 3% per year thereafter. Orchid Pharmaceuticals currently has 200 million outstanding shares. What is the value of Orchid Pharmaceuticals stock if its equity cost of capital equals 11%?
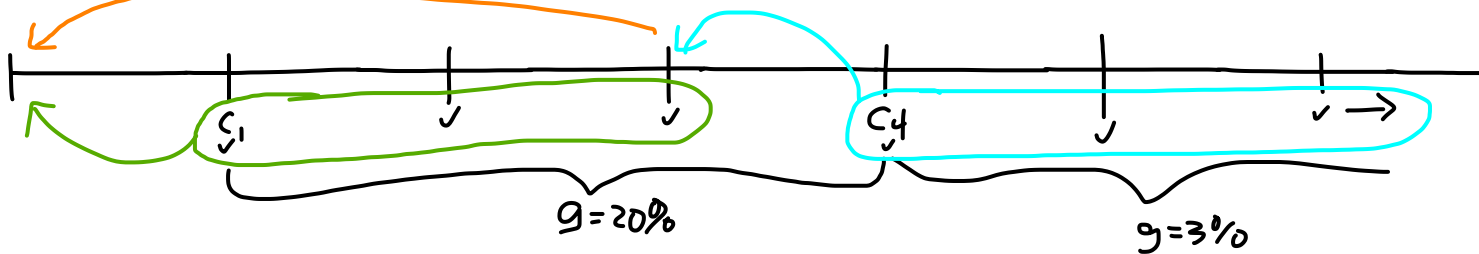
$$C_1 = (.25 + .15)(600) \quad +8$$

$$C_4 = C_1 (1.2)^3 \quad +8$$

$$PV(Payouts) = \left(\frac{C_1}{.11 - .2}\right)\left(1 - \left(\frac{1.2}{1.11}\right)^3\right) + \left(\frac{C_4}{.11 - .03}\right)\left(\frac{1}{1.11}\right)^3 = A$$

$$P_0 = \frac{A}{200} \quad +8$$