Name: _____ (1pts)

SID: _____ (1pts)

A. Any communication with other students during the exam (including showing, viewing or sharing any writing) is strictly prohibited. Any violation will result in a score of 0 points for the exam.

B. Answer each of the following questions in the space provided. If you need more space to show major computations you performed to obtain your answer for a particular problem, use the back of the preceding page.

C. For problems show both the analytical formula for the answer and compute the numerical value of the answer, unless told otherwise. No credit will be given to numerical answers without the proper setup.

D. This exam is closed book; however you may use your 1 sided "cheat sheet" as described in class and on bcourses.

E. You may use any calculator without communication ability.

F. Present your work in an organized and neat fashion.

G. Good luck!

Multiple Choice– circle the (unique) correct answer. (2 points each)

1) Explain the difference between an S corporation and a C corporation.

   a) C corporations must pay corporate income taxes; S corporations do not pay corporate taxes but must pass through the income to shareholders to whom it is taxable.

   b) S corporations must pay corporate income taxes; C corporations do not pay corporate taxes but must pass through the income to shareholders to whom it is taxable.

2) What is the most important difference between a corporation and all other organization forms?

   a) A corporation is a legal entity managed by its owners.

   b) A corporation is the only legal entity that can issue bonds to raise money.

   c) A corporation is a legal entity separate from its owners.

   d) A corporation is the only legal entity that pays taxes.

3) A 2% increase in fees in your 401k reduces your retirement savings by approximately

   a) 1-3%

   b) 30-50%

   c) 95-99%

4) Explain how the bid-ask spread is determined today.

   a) The limit buy order with the lowest price is the ask price.

   b) The limit sell order with the highest price is the bid price.

   c) **The limit sell order with the lowest price is the ask price**.

5) Why might a Roth IRA be   preferable to a 401k plan?

   a) When your company matches your 401k contributions.

   b) If your retirement tax rate is expected to exceed your current tax rate.

   c) When your retirement contribution exceeds the 401k limit.

Problems – show all work

6) (18pts) You run a construction firm. You have been offered a contract to build a government office building. It will take two years to construct. It will require an investment of $20million today and $10million in one year. The government will pay you $40million upon the building's completion. Suppose the cash flows and their times of payment are certain, and the risk-free interest rate is 5%.
   a) Draw a timeline for this project.
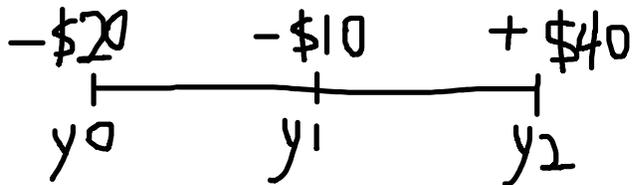
   b) What is the NPV of this opportunity?

NPV=-20-10/1.05+40/(1.05)^2 = $6.76 million

   c) Should you accept this offer?

Yes, NPV>0

   d) What is the lowest payment for which you should accept this offer?

0=-20-10/1.05+x/(1.05)^2 → x=$32.55 million

7) (10pts) You are head of the foundation. You have decided to fund a school in perpetuity. Every 5 years, you will give the school $1million. The first payment will occur 5 years from today. The interest rate is 5% per year.
a) What is the present value of the gift?

r = 1.05^5 -1 = 0.276
NPV = 1/0.276 = $3.62 million

b) Suppose you want to increase the gift by 3% every 5 years. In this case, what is the present value of the gift?

g=0.03
NPV = 1/(.276-.03)=$4.065 million

8) (6pts) If the 1-year risk free rate is 3% and the 2-year risk free rate is 6%, what is the 2-year forward risk free rate?

(1.03)(1+y)=(1.06)^2 → y=9.09%

9) (18pts) Consider a 30-year mortgage on at $400,000 house that requires monthly payments and has an interest rate (APR) of 8% per year. You have $50,000 in cash that you can use as a down payment on the house, but you need to borrow the rest of the purchase price.

   a) What will your monthly payments be if you sign up for this mortgage?

$PV=400{,}000-50{,}000=350{,}000$, $r = .08/12$, $n=360$

$PV = (C/r)(1-(1+r)^n)$ →

$C=PV*r/(1-(1+r)^n) = \$2{,}568.18$

   b) Suppose you sell the house after 10 years. How much will you need to pay off the remaining mortgage at that time (the end of year 10)?

$C=$ above, $n=20*12=240$, $r=.08/12$

$PV = (C/r)(1-(1+r)^n) = \$307{,}037$

10) (18pts) You have been offered a very long-term investment opportunity. You can invest $ 1,000 today and expect to receive $100,000 in 20 years. Your cost of capital for this (very risky) opportunity is 25%.
   a) What is the IRR of this investment?

PV = -1+100/(1+IRR)^25=0 → IRR=25.9%

   b) What does the IRR rule say about whether the investment should be undertaken?

Yes, the IRR is greater than the cost of capital.

   c) Is the IRR rule correct? (Justify your answer.)

PV = PV = -1,000+100,000/(1.25)^20 = 152.9 <0 so the IRR rule is correct

11)(18pts) Consider the following three risk free bonds, each with $100 face value:
  (1) a 1-year zero coupon bond with a YTM of 5%,
  (2) a 2-year zero coupon bond which costs of $95,
  (3) a 2 year bond with 10% yearly coupons that costs $90.

  a) What is the price of bond (1)?

PV=100/1.05=95.2

  b) What is the YTM of bond (2)?

95= 100/(1+YTM)^2 → YTM = 0.026

  c) Using only long and short positions on these three bonds create an arbitrage opportunity?

	Payoff after 1 year	Payoff after 2 years
Bond (1)	100	0
Bond (2)	0	100
Bond (3)	10	110

For first year payment: 10/100 = 0.1
For second year payment: 110/100=1.1

So buying .1 of bond (1) and 1.1 of bond (2) is equivalent to buying 1 of bond (3). The cost of this would be .1*95.2+1.1*95 = $114.02, which is greater than the cost of bond 3 ($90)

So short sell .1 of bond (1) and 1.1 of bond (2) and buy 1 of bond (3) with the proceeds for a profit of $24.024.