11.431J/15.426J Real Estate Finance & Investments, Fall 2002, Practice Midterm Exam
There are two parts to this quiz, plus an extra-credit question. The entire quiz is designed to be easily finished in 75 minutes. No open books or notes are permitted. (Some mathematical formulas are given on the last page.)

Your name:_____ ID#_____

Part I: Multiple Choice (80% of grade, 26 equal-weighted questions). Select the *best* alternative answer, based on what was taught in the course. Clearly indicate your selection by circling it. If it is not clear to the TA which your choice is, you will receive no credit. *Read the question carefully before answering*.

1. Which are the two fundamental markets in commercial real estate?
(a) The space market and the asset market.
(b) The space market and the money market.
(c) The construction market and the land market.
(d) The asset market and the stock market.

2. Total development costs (including sufficient profit for the developers) are $200/SF. Investors are willing to pay property prices of $10.00 per dollar of current rental income. What is the "replacement cost rent" in this market?
(a) $20.00/SF.
(b) $16.00/SF.
(c) $12.50/SF.
(d) $10.00/SF.

3. All of the following are major determinants of cap rates in the property asset market, *except*:
(a) The opportunity cost of capital (as determined in the capital market).
(b) The expected growth in property rents (as determined in the space market).
(c) The risk perceived for the property (as determined in the space and capital market).
(d) The equilibrium "replacement cost rent" (as determined in the space market).

4. The development industry is the most *cyclical* and *volatile* branch of the real estate business, because:
(a) Developers are stupid.
(b) Developers borrow too much money.
(c) It is hard to predict how much a building's construction will cost.
(d) There is only need for new supply of space when the economy is growing or changing.

5. The "real estate system" consists of the following three major components:
(a) The space market, the capital market, and the mortgage industry.
(b) The space market, the asset market, and the development industry.
(c) The public equity market, the private equity market, and the debt market.
(d) The capital market, the government, and land.

6. Which of the following is an example of "negative feedback" in the real estate system?
(a) Since the stock of built space cannot readily shrink, rents will fall when demand falls.
(b) Lenders make money by issuing loans, so they tend to keep the capital flowing to developers even during down markets.
(c) Real estate markets exhibit inertia, so market participants rationally extrapolate past rent trends into the future.
(d) Growth in space usage demand stimulates increased rents or improved prospects for future rents, which increases the present value of real estate assets, which improves the profitability of new development projects.

7. Suppose the most productive use of a particular site is as a manufacturing plant that will generate revenues of $12,000,000 per year with raw material costs and operating expenses (other than net rent) of $7,000,000 per year, and construction costs (for the plant and equipment) that can be paid for with a perpetual loan with interest of $3,000,000 per year. According to the residual theory, how much is this site worth in terms of annual land rent?
(a) $12,000,000.
(b) $9,000,000.
(c) $5,000,000.
(d) $2,000,000.

8. All the following statements about the "Highest & Best Use Principle" (HBU) are true *except*:
(a) According to the HBU principle, each location should be used in the way that is most productive (highest land residual rent) for that site.
(b) HBU will be the result of long run equilibrium in the land market because in the long run land use is flexible, and more productive uses will outbid lesser productive ones for each site.
(c) According to basic economic theory, in the absence of regulatory constraints each site will always be used at its HBU.
(d) The HBU principle is consistent with the empirical result that higher density land uses tend to be found in more central locations.

9. What is the percentage change in the location rent premium at the center of a simple monocentric city (like the one in Chapter 4) as a result of the following combined effects holding population constant: (i) 20% increase in real per capita income results in 30% increase in overall average per capita residential land area (people buy more houses per capita &/or houses on larger lots); *and* (simultaneously) (ii) 10% increase in transport cost per capita per mile due to greater value of travel time (partly offset by purchase of more efficient or more comfortable means of transport).
(a) Central location rent decreases exactly 20%.
(b) Central location rent decreases approximately 15.4%.
(c) Central location rent decreases approximately 3.5%.
(d) Central location rent increases approximately 56%.

10. Which of the following types of activity centers would you expect might have the highest land rent location premium in a polycentric city?
(a) An "Edge City".
(b) A Neighborhood Business District (NBD).
(c) Land adjacent to the city's major airport.
(d) A very upscale, low-density residential neighborhood in the suburbs.

11. According to the Burgess ring model of urban form:
(a) Statements (c) and (d) below are both true.
(b) Statements (c) and (e) are both true.
(c) Similar land uses arrange themselves in rings equidistant from the historical center of the metro area.
(d) Similar land uses arrange themselves in sectors along the same direction out from the historical center of the metro area.
(e) The historical patter of development, from the center outward, is an important determinant of the type of land use found in different parts of the metro area.

12. Consider a very well maintained single-family home whose construction originally cost $100,000 twenty years ago (when the consumer price index was two-thirds its current level), and whose construction cost new today (excluding land) would be $200,000, located in a neighborhood in which it is now profitable (and legal) to build higher density apartments or condos. Considering the effect of "economic depreciation", the value of this house (that is, the structural component of the value of the property) is now probably approximately:
(a) $200,000.
(b) $150,000.
(c) $100,000.
(d) Zero.

13. Which of the following depicts an important difference between the structure of investment products in the traditional real estate sector as opposed to the industrial corporate sector represented by the stock market?
(a) Real estate investment products include only equity while industrial corporations typically support both debt and equity investment products.
(b) In real estate it is possible for investors to invest directly in the underlying physical assets which themselves trade in generally well developed private property markets.

14. All of the following are examples of the "income objective" of investment except:
(a) A 65-year-old planning how to use her wealth to support herself now that she is retired.
(b) A pension fund trying to match revenues to its current pension payout needs.
(c) A university endowment fund wanting to use gift assets to fund an annual scholarship program.
(d) A 25-year-old planning to be able to buy a house in 5 years.
(e) A bank investing assets so as to be able to pay interest on current savings deposits.

15. Which of the following is true about typical real estate investment (unlevered, at the direct property level) and inflation risk?
(a) Real estate investment appreciation returns do not generally keep pace with inflation in the long run, but real estate investment provides a hedge against inflation risk in that unexpected changes in inflation tend to be positively correlated with changes in property value in the short to medium term.
(b) Real estate investment appreciation returns generally at least equal the inflation rate in the long run, but real estate does not provide a good hedge against inflation risk in that unexpected changes in inflation do not tend to be positively correlated with changes in property value in the short to medium term.
(c) Real estate investment appreciation returns generally at least equal the inflation rate in the long run, and real estate investment provides a hedge against inflation risk in that unexpected changes in inflation tend to be positively correlated with changes in property value in the short to medium term.
(d) Real estate investment appreciation returns do not generally keep pace with inflation in the long run, and real estate does not provide a good hedge against inflation risk in that unexpected changes in inflation do not tend to be positively correlated with changes in property value in the short to medium term.

16. You need to borrow $80,000 for a down-payment on a house. You would like to pay the loan off in 15 years. With 9% interest on the loan, what will be your monthly payment?
a) $600.00.
b) $811.41.
c) $1005.78.
d) $7200.00.

17. In which of the following situations would it be most appropriate to measure an investment manager's performance using the IRR rather than the time-weighted average periodic return?
(a) Client hires manager to place capital as soon as possible.
(b) Client requires a large proportion of its invested capital to be liquid at all times for withdrawal on demand.
(c) Client gives manager a line of capital with discretion over when to acquire and dispose of illiquid assets.
(d) All of the above.

18. The expected return on an investment in a property is <u>inversely</u> related to the price you pay for the property fundamentally <u>because</u>:
(a) The future cash flows the property can generate are independent the price you pay for the property today.
(b) The return must include a risk premium.
(c) Inflation must be subtracted out.
(d) The investor faces a budget constrain.
(e) None of the above.

19. The table below shows two 10-year cash flow projections (in $ millions, including reversion) for the same property. The upper row is the projection that will be presented by the broker trying to sell the building, the bottom row is the realistic expectations. Suppose that it would be relatively easy for any potential buyers to ascertain that the most likely current market value for the property is about $10 million. What is the most likely amount of "disappointment" in the ex post annual rate of total return earned by an investor who buys this property believing the broker's cash flow projection?

Year	1	2	3	4	5	6	7	8	9	10
Presented	$1.0000	$1.0300	$1.0609	$1.0927	$1.1255	$1.1593	$1.1941	$1.2299	$1.2668	$14.7439
Realistic	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$11.0000

(a) 0.00%
(b) 1.00%
(c) 3.00%
(d) 26.68%
(e) Cannot be determined from the information given.

20. The table below shows the projected cash flows (including reversion) for Property A and Property B. If both properties sell at *fair market value* for a cap rate (initial and terminal cash yields) of 8%, then which statement below correctly describes the relative investment risk in the two properties?

Annual net cash flow projections for two properties ($ millions)									
Year	1	2	3	4	5	6	7	8	9	10
A	$1.0000	$1.0300	$1.0609	$1.0927	$1.1255	$1.1593	$1.1941	$1.2299	$1.2668	$18.10
B	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$1.0000	$13.50

(a) Property A is more risky.
(b) Property B is more risky.
(c) Both properties are equally risky.
(d) Cannot be determined based on the information given.

21. You are trying to apply a multi-year DCF analysis to evaluate an investment property with some long-term leases in it. You observe that other properties with similar lease structure and risk have been selling at cap rates around 11% (based on NOI with no capital reserve). You believe these other properties typically face capital expenditures on the order of 1% of property value per year in the long run, and that given such expenditures their net cash flows and values would reasonably be expected to grow in the long run at about 3% per year. What discount rate should you apply to your subject property in your DCF valuation?
(a) The Treasury bond rate because of the long-term leases.
(b) 10%
(c) 13%
(d) 14%
(e) Cannot be determined from the information given.

22. Normally, one would expect what relation between the "going-in" and "going-out" cap rate?
(a) The going-in cap rate should be higher than the going out.
(b) The going-out cap rate should be at least as high as the going-in rate.
(c) There is no particular relation between the two.

23. Suppose the lease on a certain space will expire at the beginning of 2001. You believe that the probability of the existing tenant renewing is 50 percent. If he renews, you will need to spend only an estimated $5.00/SF to upgrade his space. If he does not renew, it will take $25.00/SF to modernize the space, even then you expect 6 months of vacancy. What expected cash flow forecast should you put in year 2001 of your pro-forma for this space, if you expect triple-net market rents on new leases in 2001 to be $20/SF?
(a) $17.50/SF
(b) $15.00/SF
(c) zero
(d) - $10.00/SF
(e) Insufficient information provided to answer the question.

24. Suppose you analyze a particular deal and it appears that for an investment of $1,000,000 your client can obtain a positive NPV of over $500,000. Your client is typical of the type of high tax bracket individual investors who commonly purchase and sell this type of property, and indeed typically determine equilibrium prices in the asset market in which these properties are sold. What should you do?
(a) Reject the deal out of hand because it costs twice as much as its NPV.
(b) Phone your client right away on your cell phone and urge her to pounce on this deal before it "gets away" - the seller must have made a mistake in their offering price!
(c) Buy the property with cash, take out an 80% loan-to-value ratio mortgage, and laugh all the way to the bank with $200,000 of arbitrage profits!
(d) Sharpen your pencil, double-check your assumptions and analysis, try to find what is unique about your client.
(e) Cannot be answered from the information given.

Use the following information to answer the two questions below. REIT A has expected total return on equity of 15%, interest on their debt is 9%, and their debt-to-total-value ratio is 40%. Property X has current annual net income of $2,000,000 and sells in a market where cap rates are currently 9%, and long-term growth expectations for the property cash flow and value are 1% per year. The REIT market and private property market in general are currently in equilibrium (that is, REIT shares in general are selling in the stock market at prices equal to their NAV in the property market).

25. What is REIT A's average cost of capital?
(a) 9.0%
(b) 10.4%
(c) 12.6%
(d) 15.0%
(e) Insufficient information to answer this question.

26. What is the NPV to REIT A of a deal to purchase Property X at a price of $18,000,000?
(a) -$2,127,000
(b) -$759,000
(c) Zero, by definition.
(d) +$2,000,000
(e) +$4,222,000.

Part II (20%): Answer either one of the questions below, or *diversify your portfolio* by answering both. If you answer both, we will grade both and assign each question half of the 20% for this part. If you answer only one, that one you answer will get the full 20%. Please be sure it is clear to us which question(s) you want to be graded. If the TA cannot figure it out on his own, he will grade both.

1. Suppose you own a vacant but developable land parcel on the outskirts of the metropolitan area. This land produces no income but owes 2% of its value per year in property taxes. Meanwhile, typical income properties are yielding 9% (that is, they have a current cash yield, or "cap rate", of 9%). If inflation is expected to be around 3% per year, and you expect your land will appreciate at 10% per year, what should you do with this land parcel? (Be specific and please explain *why* you should do what you say.)

2. At site "A" the best current construction project is a retail plaza that would cost $3,000,000 to build (exclusive of land cost) and would then generate net rents of $400,000/yr, expected to grow at 2% per year indefinitely. At site "B" the best current construction project is an office building that would generate net rents of $500,000 per year, expected to remain constant. Construction of the office building would cost $4,000,000 (exclusive of land cost). Suppose investors the completed buildings (stabilized operation) would require an expected total return on their investment of (i.e., the opportunity cost of capital is) 10% per year.

a) Based on the current best projects described above, what is the value of the land at each site?

b) Suppose the current market value of both undeveloped sites is $1,500,000 each. On which site or sites is it currently profitable to develop, and why?

c) In (b), is there an "irreversibility premium" apparent in the value of either site? If so, which site, and how much?

Part III: Extra-credit question. Earn up to 5% extra credit. It can help you but not hurt you. And this time, *no diversification*. You must pick **only one** of the questions below to answer. If the TA cannot tell which one you wanted, he will simply grade the first. (Aside: Do you get how valuable diversification is if you are risk-averse?)

1. On Dec.31 1999 you buy a property for $1,000,000. On Dec.31 2000 that property yields $100,000 of net cash flow which you take and spend on a New Year's Eve bash. Also on Dec.31 2000 the property is appraised at $1,010,000 in value, but you don't sell it then. On Dec.31 2001 the property yields another $100,000 in net cash flow which you spend on another bash, in part to celebrate the fact that you sold the property that very day for $1,200,000. There are no other cash flows from this investment. (1 point for each correct answer below.)
(a) What is the simple HPR total return on your investment in this property for the calendar year 2000?
(b) What is the simple HPR total return on your investment in this property for the calendar year 2001?
(c) What is the annual time-weighted **arithmetic** mean periodic total return for this property during the two-year period from the beginning of 2000 through the end of 2001?
(d) What is the annual time-weighted **geometric** mean periodic total return for this property during the two-year period from the beginning of 2000 through the end of 2001?
(e) What is the IRR (per annum) on your investment in this property "cradle-to-grave" (that is, over the entire 2-year period you held the property, from purchase to sale)?

2. An apartment complex has 100 units of which on average 5 are vacant at any given time. Per unit, the rent is $1000 per month, and the operating expenses paid by the landlord (including realistic capital reserve) average $5000 (per *occupied* unit) per *year*. Both rents and expenses are expected to grow at 1 percent per year in perpetuity, and the building value is expected to remain a constant multiple of its net income.
(a) (1 pt) What is the projected potential gross income (PGI) for the property in the first year?
(b) (1 pt) What is the projected effective gross income (EGI) for the property in the first year?
(c) (1 pt) What is the projected net operating income (NOI) for the property in the first year?
(d) (2 pts) Suppose historically properties like this have averaged total returns of 10% per year when T-bills have averaged returns of 7%. If T-bills are currently yielding 5%, what is the NPV of a deal to purchase this property for $7,000,000?

Formulas that may (or may not) be useful in this exam . . .

$$a + da + d^2a + \ldots + d^{n-1}a \quad = \quad a(1-d^n)/(1-d).$$

$$PMT/(1+r) + PMT/(1+r)^2 + \ldots + PMT/(1+r)^n \quad = \quad (PMT/r)[1 - 1/(1+r)^n].$$

$$CF + CF/(1+r) + CF/(1+r)^2 + \ldots + CF/(1+r)^{n-1} \quad = \quad (1+r)(CF/r)[1 - 1/(1+r)^n].$$

$$CF/(1+r) + (1+g)CF/(1+r)^2 + (1+g)^2CF/(1+r)^3 + \ldots \text{(forever)} \quad = \quad CF/(r-g).$$