1) I buy a $200,000, house with a 30 year loan at 5% interest **compounded monthly.** My monthly payments begin immediately. Find my monthly payment (paid at the beginning of each month). *( 7 pts.)*

$$A(t) = \left(1+\frac{i}{n}\right)^n P - \left(1+\frac{i}{n}\right)\frac{\left(1+\frac{i}{n}\right)^n - 1}{\frac{i}{n}} D$$

$$0 = \left(1+\frac{.05}{12}\right)^{12\cdot 30}(200{,}000) - \left(1+\frac{.05}{12}\right)\frac{\left(1+\frac{.05}{12}\right)^{12\cdot 30} - 1}{\frac{.05}{12}} D$$

$$835.726379\,4D = 893548.8626$$

$$D = 1069.19 \text{ dollars}$$

100

2) I buy a $500,000 house with a 25 year loan at 5% interest compounded monthly. The bank tells me that my monthly payments will be $3223.13 paid at the beginning of each month. How much do I still owe after 10 years of payments i.e. immediately after the 120th payment? *( 7 pts.)*

$$A(t) = \left(1+\frac{.05}{12}\right)^{12\cdot 10}(500{,}000) - \frac{\left(1+\frac{.05}{12}\right)\left(1+\frac{.05}{12}\right)^{12\cdot 10}-1}{\frac{.05}{12}}(3223.13)$$

$A(t) = 823504.7488 - 502580.369$

$A(t) = 320924.38$ dollars

100

3) On January 1, 2009, I won a prize that promised to pay $100,000 at the beginning of the year for 20 years. I am currently running short of money. I decide to sell my rights to my payments to Sue. She will pay me $1,000,000 dollars on Jan. 1, 2014 and I will give her all of the future payments including the Jan. 1, 2014 payment. Calculate Sue's profit, given that interest rates are currently running 4% per year. *Hint:* Sue's profit will be the present value of all of the payments she will receive, computed at the time of purchase, minus what she paid. *( 7 pts.)*

$$FV = \frac{(1+.04)^{15} - 1}{.04}(100{,}000)(1.04)$$

$FV = 2082453.114$

$PV = 2082453.114(1.04)^{-15}$

$PV = 1{,}156{,}312.293$

$profit = 1{,}156{,}312.293 - 1{,}000{,}000.00$

profit = 156,312.29 dollars

4) At the end of year 1 I deposit $2,000 into an account that is earning 4% interest compounded annually. At the end of each subsequent year I deposit 2 % more than I did the previous year. How much do I have in the account immediately after my after 25th deposit? **Do not use any formulas not contained in the notes to solve this problem.** *( 5 pts.)*

$$A(t) = (2000)(1.04)^{24} + (2000)(1.02)(1.04)^{23} + (2000)(1.02)^2(1.04)^{22} + \ldots + (2000)(1.02)^{23}(1.04) + 2000(1.02)^{24}$$

$$A(t) = 2000(1.04)^{24}\left[1 + (1.02)(1.04)^{-1} + (1.02)^2(1.02)^{-2} + \ldots (1.02)^{24}(1.04)^{-24}\right]$$

geometric series $\quad X = (1.02)(1.04)^{-1}$

$$A(t) = 2000(1.04)^{24}\left[\frac{X^{n+1} - 1}{X - 1}\right]$$

$$A(t) = (2000)(1.04)^{24}\left[\frac{\left[(1.02)(1.04)^{-1}\right]^{25} - 1}{\left[(1.02)(1.04)^{-1}\right] - 1}\right]$$

$$A(t) = 5126.60833\left[\frac{-.384\,581\,124}{-.019\,230\,769}\right]$$

$$A(t) = 5126.60833\,(19.998\,218\,53)$$

$$\boxed{A(t) = 102{,}523.03 \text{ dollars}}$$

100

5) Give the five characteristics of an insurable risk as stated in the reading from J&L. They need not be in a specific order. *( 5 pts.)*

a. Loss must be definite ✓

b. Loss must be significant ✓

c. loss must occur by chance ✓

d. loss must be predictable ✓

e. loss must not be catastropic ✓ to the insurer

6) Define

a. Contract of indemnity *( 3 pts.)*

states that the amount paid when a loss occurs will be paid out based on the value at the time of loss, usually subject to a deductible

b. Rates of morbidity *( 3 pts.)*

probability rate that sickness or injury will occur in different groups of people

c. Ceding company *( 3 pts.)*

The company that is passing on part of the risk by purchasing insurance from another company called the reinsurance company

100

d. Mutualization *( 3 pts.)*

the process of converting from a stock company to a mutual company

7) According to J&L, what are three entities, other than insurance companies, that can sell insurance? *( 5 pts.)*

1) Fraternal benefit societies

2) Banks

3) government

8) Ed has an accident and hits Megan's car. It is Ed's fault. Both Ed and Megan are fully insured. State which coverage under the automobile insurance policy would pay for the costs listed below. ***Assume the coverage is in a no-fault state.***

a) Ed has to be taken to the hospital and treated for his injuries. Which coverage of pays for Ed's hospital costs? *( 2 pts.)*

Ed's personal injury protection

b) Megan also is injured and has to be treated at the hospital. Which coverage pays for her hospital costs? *( 2 pts.)*

Megan's Personal Injury Protection

c) Megan's car is damaged from the accident. Which coverage pays for the damage to Megan's car? *( 2 pts.)*

Ed's liability insurance

d) Which coverage pays for the damage to Ed's car caused by the accident? *( 2 pts.)*

Ed's collision insurance

9) Assume that in the preceding question the state IS NOT a no-fault state. Answer the following questions:

e) Ed has to be taken to the hospital and treated for his injuries. Which coverage of pays for Ed's hospital costs? *( 2 pts.)*

Ed's medical payments

f) Megan also is injured and has to be treated at the hospital. Which coverage pays for her hospital costs? *( 2 pts.)*

Ed's liability ✓

g) Megan's car is damaged from the accident. Which coverage pays for the damage to Megan's car? *( 2 pts.)*

Ed's liability ✓

h) Ed's friend Sam who was riding with Ed also needed to go to the hospital. What coverage pays for Sam's medical expenses? *( 2 pts.)*

Ed's liability ✓

10) A home owner' policy generally consists of two major sections, the first labeled A-D and a second part. My house was flooded. The flood waters destroyed my television.

a. What part and section of my policy would normally cover the damage to my television? *( 3 pts.)*

Section I Part C ✓

b. My claim to repair my television was denied by the insurance company due to the ***doctrine of proximate cause*** despite the fact that my television was covered. What does this tell you about the coverage of my homeowner's policy? Explain in terms of the doctrine of proximate cause. *( 4 pts.)*

This tells me that my homeowner's policy did not include flooding as a covered peril. Since a covered peril MUST BE the proximate cause of the covered loss by the doctrine of proximate cause, my homeowner's policy would not cover the loss.

11) What is the ***doctrine of contributory negligence***? The ***fellow-servant doctrine***? The ***assumption-of-risk doctrine***? How do these doctrines relate to workman's compensation insurance? *( 7 pts.)*

doctrine of contributory negligence: If you contributed in some way to your injury or illness, workers compensation would not cover loss

fellow-servant doctrine: If a co-worker's negligence contributed to your illness or injury, worker's compensation would not cover the loss

assumption-of risk doctrine: Because you knew of the inherent dangers of the job prior to working, worker's compensation would not cover the loss

Today these doctrines no longer hold true in the context of workman's compensation insurance because it is now considered to be a no-fault situation.

12) My house is currently worth $800,000. My home owner's policy has a $5,000 deductible and my insurance company requires 85% coinsurance. I had $50,000 fire damage for which the insurance company paid $40,000. How much did I have the house insured for? *( 7 pts.)*

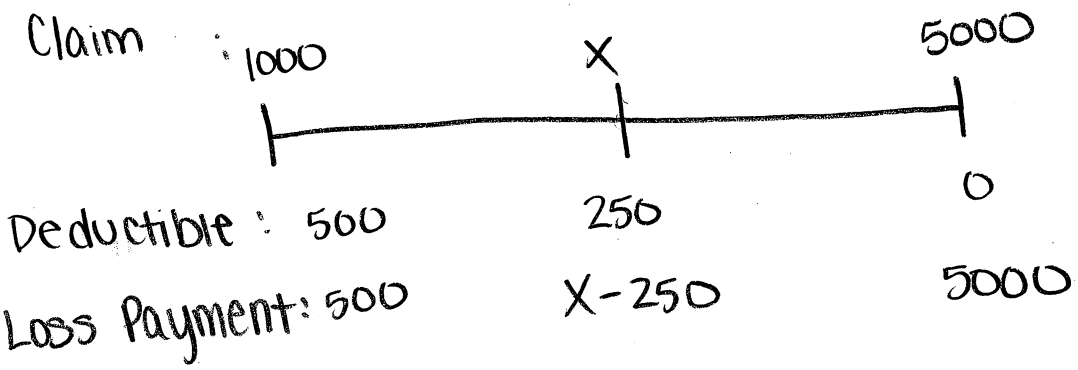
$$\frac{X}{(.85)(800{,}000)}(50{,}000-5000) = 40{,}000$$

$$\frac{X}{(.85)(800{,}000)}(45{,}000) = 40{,}000$$

$$\frac{X}{680{,}000} = \frac{8}{9}$$

$X = 604{,}444.44$ dollars

13) I have a $250,000 fully insured house with a linearly disappearing deductible. For losses of $1000 or less, I pay $500 while for losses $5,000 or more I pay nothing. I had a loss for which I paid $250. What was the value of my loss? *( 7 pts.)*




$$250 = \frac{(5000 - X)}{(5000 - 1000)}(500)$$

$$.5 = \frac{(5000 - X)}{4000}$$

$$2000 = 5000 - X$$

$X = 3000$ dollars

14) Below you are given a table of losses evaluated at 1/1/2012 for No Go Auto Insurance. Assume all losses are fully developed at 48 months. Fill in the corresponding paid loss development factors in the second table. Give answer accurate to at least two digits after the decimal. *( 4 pts.)*

## Loss Reserves

| Accident Year | Cumulative Paid Losses Development Stage in Months | | | |
|---|---|---|---|---|
| | 12 | 24 | 36 | 48 |
| 2009 | 2,000 | 2,400 | 2,880 | 3,744 |
| 2010 | 3,000 | 3,300 | 4,950 | |
| 2011 | 2,500 | 3,250 | | |
| 2012 | 1,000 | | | |

## Development Stage in Months
## Paid Loss Development Factors

| Accident Year | Cumulative Paid Losses Development Stage in Months | | |
|---|---|---|---|
| | 12-24 | 24-36 | 36-48 |
| 2009 | 1.2 | 1.2 | 1.3 |
| 2010 | 1.1 | 1.5 | |
| 2011 | 1.3 | | |
| 2012 | | | |

*15)* Based on the data in the preceding problem, No Go's actuaries decided to use the loss development factors given below. What would their estimated reserves be for each of 2009, 2010, 2011, and 2012? *( 4 pts.)*

## Selected Loss Development Factors

| 12-24 | 24-36 | 36-48 | 48-Ult. |
|---|---|---|---|
| 1.2 | 1.4 | 1.3 | 1 |

2009 Reserve = 0 dollars

2010 Reserve = 1485 dollars

2011 Reserve = 21065 dollars

2012 Reserve = 1184 dollars