Chapter 3, Section 2

1. Calculate the present value of an annuity that pays 100 at the end of each year for 20 years. The annual effective interest rate is 4%.

2. Calculate the present value of an annuity that pays 100 at the end of each month for 20 years. The nominal interest rate is 12% compounded monthly.

3. Calculate the present value of an annuity that pays 100 at the end of each month for 20 years. The annual effective interest rate is 12%.

4. Erin invests 1000 at the end of each year for 10 years. She earns an annual effective interest rate of 6%. How much will she have at the end of 10 years?

5. Mike wants to buy a car in five years. He wants to have saved 50,000 to buy the car at that time. If Mike earns 8% compounded monthly, how much must he invest at the end of each month for the next five years?

6. James buys a car today by taking a loan of 50,000. This five year loan has an nominal interest rate of 8% compounded monthly. Calculate the monthly loan payments that James must make at the end of each month for the next five years.

7. Heather won the lottery! She has the following payout options:
   a. One million at the end of each year for the next 20 years; or
   b. A lump sum of 7,469,443.62.
   Calculate the annual effective interest rate at which both options have the same present value.

8. Josephine is paying a car loan with payments of 200 at the end of each month. The loan has a monthly effective interest rate of 1%. If the car loan is for 7,218.90, calculate the number of payments that Josephine will need to make.

9. For a given interest rate, $s_{\overline{n}} = 14.2068$ and $a_{\overline{n}} = 8.3064$. Calculate n.

10. If d = 0.05, calculate $a_{\overline{12}}$.

11. The accumulated value of an n year annuity is four times the present value of the same annuity. Calculate the accumulated value of 100 in 2n years.

12. No. 2 in the book.

Chapter 3, Section 3

13. John's father is paying him 500 at the beginning of each month for the next four years while he is in college. Calculate the present value of this annuity on the date of the first payment using an interest rate of 9% compounded monthly.

14. Sarah is depositing 300 into an account at the start of each quarter. How much will she have at the end of 4 years at an interest rate of 7% compounded quarterly?

15. Kathy wants to accumulate a sum of money at the end of 10 years to buy a house. In order to accomplish this goal, she can deposit 80 per month at the beginning of the month for the next ten years or 81 per month at the end of the month for the next ten years. Calculate the annual effective rate of interest earned by Kathy.

16. No. 6 in the book

17. No. 7 in the book

Answers

1. 1359.03
2. 9081.94
3. 9446.23
4. 13,180.79
5. 680.49
6. 1013.82
7. 12.00%
8. 45
9. 11
10. 8.73
11. 1600
12. .85801217
13. 20,243.08
14. 5580.48
15. 16.075%
16. 32.12891
17. 237

Chapter 3, Section 4

18. Calculate the present value of a perpetuity immediate that pays $1000 per year if the present value is calculated using an annual effective interest rate of 12%.

19. Calculate the present value of a perpetuity due that pays $1000 per year if the present value is calculated using an annual effective interest rate of 12%.

20. Calculate the present value of a perpetuity immediate that pays $1000 per month if the present value is calculated using a nominal rate of interest rate of 12% compounded monthly.

21. Calculate the present value of a perpetuity due that pays $1000 per month if the present value is calculated using an annual effective interest rate of 12%.

22. Katie buys a perpetuity due of 1000 per month for 100,000. Calculate the annual effective rate of interest used to calculate the price of this perpetuity.

23. The value of a perpetuity immediate where the payment is P is 1000 less than the value of a perpetuity due where the payment if P. Calculate P.

24. A perpetuity is funded by a donation of 1,000,000. Payments of P are to be made at the end of every third year. In other words, P will be paid at time 3, 6, 9, etc. If the fund earns an annual effective interest rate of 6%, calculate P.

25. Number 2 from the Book

Chapter 3, Section 5

26. A monthly annuity immediate pays 100 per month for 12 months. Calculate the accumulated value 12 months after the last payment using a nominal rate of 4% compounded monthly.

27. A monthly annuity due pays 100 per month for 12 months. Calculate the accumulated value 12 months after the last payment using a nominal rate of 4% compounded monthly.

28. A monthly annuity due pays 100 per month for 12 months. Calculate the accumulated value 24 months after the first payment using a nominal rate of 4% compounded monthly.

29. Calculate the current value at the end of 5 years of an annuity due paying annual payments of 1200 for 12 years. The annual effective interest rate is 6%.

30. Calculate the present value of an annuity immediate with 20 annual payments of 500 if annuity does not start until five years have passed. The annual effective interest rate is 8%.

31. John buys a series of payments. The first payment of 50 is in six years. Annual payments of 50 are made thereafter until 14 total payments have been made. Calculate the price John should pay to realize an annual effective return of 7%.

32. Which of the following are true:

    i. $\ddot{a}_{\overline{10}} - \ddot{a}_{\overline{3}} = a_{\overline{9}} - a_{\overline{3}}$

    ii. $v^3 \ddot{a}_{\overline{3}} = v^2 a_{\overline{3}}$

    iii. $v^8 s_{\overline{12}} = \ddot{a}_{\overline{3}} + \ddot{s}_{\overline{9}}$

Answers

18. 8333.33
19. 9333.33
20. 100,000
21. 106,387.48
22. 12.8178%
23. 1000
24. 191,016
25. 245,695.34
26. 1272.04
27. 1272.04
28. 1276.28
29. 14,271
30. 3341.03
31. 311.77
32. All but iii

Chapter 3, Section 6

33. Julie bought a house with a 100,000 mortgage for 30 years being repaid with payments at the end of each month at an interest rate of 8% compounded monthly. What is the outstanding balance at the end of 10 years immediately after the 120th payment?

34. If Julie pays an extra 100 each month, what is the outstanding balance at the end of 10 years immediately after the 120th payment?

35. A loan 20,000 is being repaid with annual payments of 2000 at the end of each year. The interest rate charged on the loan is an annual effective rate of 8%. Calculate the outstanding balance of the loan immediately after the 5th payment.

36. Jill bought a washer and dryer for her apartment. She paid for the washer and dryer by taking out a loan with 12 monthly payments. The interest rate on the loan is 12% compounded monthly. Her monthly payment is $124.39. Calculate the outstanding balance of Jill's loan immediately after the 5th payment.

37. If Jill paid 150 per month (instead of 124.39) for the first five months, what is her outstanding balance immediately after the 5th payment.

38. Jenna has a mortgage loan for her house. The mortgage has an interest rate of 7% compounded monthly. She still has 100 monthly payments of $900 to repay the loan. The first payment is due in one month. Calculate the outstanding balance on her mortgage.

39. A loan of 10,000 is being repaid with 20 non-level annual payments. The interest rate on the loan is an annual effective rate of 6%. The loan was originated 4 years ago. Payments of 500 at the end of the first year, 750 at the end of the second year, 1000 at the end of the third year and 1250 at the end of the fourth year have been paid. Calculate the outstanding balance immediately after the fourth payment.

40. Calculate the outstanding balance to the loan in #5 one year after the fourth payment immediately before the fifth payment.

41. Number 1 in the book.

42. Number 7 in the book.

Answers

33. 87,724.16
34. 69,430.92
35. 17,653 (to the nearest $)
36. 836.92
37. 706.28
38. 68,042.82
39. 8876.56
40. 9409.16
41. See answers in book
42. See answers in book

Chapter 3, Section 7

43. An annuity pays 100 at the end of each month for 4 years and then 200 a month at the end of each month for the next four years. Calculate the present value at $i^{(12)} = 0.09$.
44. An annuity pays 100 at the end of each month for 4 years and then 200 a month at the end of each month for the next four years. Calculate the accumulated value at $i^{(12)} = 0.08$.
45. An annuity pays 100 at the end of each month for 4 years and then 200 a month at the end of each month for the next four years. Calculate the current value right after the 48th payment at $i^{(12)} = 0.09$
46. Number 1 from the Book
47. Number 2 from the Book
48. Number 6 in the Book

Chapter 3, Section 8

49. An annuity makes annual payments for 30 years. The first payment at the end of the first year is 800. Each payments increases by 10% over the previous payment. In other words, the second payment is $800(1.1)$, the third payment is $800(1.1)^2$, etc. Calculate the present value of this annuity at 6%.
50. An annuity makes annual payments for 30 years. The first payment at the end of the first year is 800. Each payments increases by 10% over the previous payment. In other words, the second payment is $800(1.1)$, the third payment is $800(1.1)^2$, etc. Calculate the accumulated value of this annuity at 6%.
51. An annuity makes annual payments for 30 years. The first payment at the end of the first year is 800. Each payments increases by 10% over the previous payment. In other words, the second payment is $800(1.1)$, the third payment is $800(1.1)^2$, etc. Calculate the present value of this annuity at 10%.
52. A perpetuity due pays 10,000 at the start of year 1. Each payment thereafter is 95% of the prior payment. Calculate the present value of this perpetuity at an annual interest rate of 5%.
53. An annual annuity due pays \$1 at the beginning of the first year. Each subsequent payment equals 105% of the prior payment. The last payment is at the beginning of the 10th year. Calculate the present value at:
    a. An annual effective interest rate of 4%;
    b. An annual effective interest rate of 5%.
54. An annual annuity immediate pays \$100 at the end of the first year. Each subsequent payment equals 105% of the prior payment. The last payment is at the end of the 20th year. Calculate the accumulated value at:
    a. An annual effective interest rate of 4%;
    b. An annual effective interest rate of 5%.
55. Number 1 in the book.

Answers

43. 9,633.21
44. 19,021.85
45. 13,789.03
46. See Book
47. See Book
48. See Book
49. 40,762.35
50. 234,118.22
51. 21,818.18
52. 105,000
53.
    a. 10.44
    b. 10
54.
    a. 4621.75
    b. 5053.90
55. See Book.

Chapter 3, Section 9

56. An annuity pays $100 at the end of one month. It pays $110 at the end of the second month. It pays $120 at the end of the third month. The payments continue to increase by $10 each month until the last payment is made at the end of the 36th month. Find the present value of the annuity at 9% compounded monthly.

57. An annuity pays 5000 at the end of the first year. At the end of the second year, the annuity pays 5600. Each subsequent payment increases by 600. A total of 30 annual payments are made. Calculate the accumulated value of this annuity using an annual effective interest rate of 3%.

58. An annuity due pays a uniformly increasing amount each month for 50 months. The amount paid is 25 at the start of the first month, 50 at the start of the second month, etc. Calculate the accumulated value of the annuity at a monthly effective interest rate of 0.25%.

59. A perpetuity pays $100 at the end of the first year. Each subsequent annual payment increases by $50. Calculate the present value at an annual effective interest rate of 10%.

60. Calculate the present value of a 12 year decreasing annuity with annual payments at the end of each year. The payments are 12,000 the first year, 11,000 the second year, etc with a payment of 1000 at the end of the 12th year. The interest rate is an annual effective interest rate of 8%.

61. An annuity pays 10 at the end of year 2, and 9 at the end of year 4. The payments continue decreasing by 1 each two year period until 1 is paid at the end of year 20. Calculate the present value of the annuity at an annual effective interest rate of 5%.

62. Number 2 in the Book
63. Number 3 in the Book

Answers

56. 8394.60
57. 589,385.39
58. 33,299.59
59. 6000.00
60. 55,799.02
61. 38.25
62. See the Book
63. See the Book

Chapter 3, Section 11

64. Number 1 in the Book

65. Number 2 in the Book

Chapter 3, Section 3.13

You are given the following table to use for Questions 64 - 66:

	Year 1	Year2	Year 3	Year 4	Year 5	Portfolio	Year
1995	.0850	.0825	.0800	.0780	.0760	.0730	2000
1996	.0825	.0800	.0775	.0755	.0735	.0705	2001
1997	.0800	.0775	.0750	.0730	.0710	.0680	2002
1998	.0750	.0725	.0071	.0690	.0670	.0650	2003
1999	.0700	.0675	.0655	.0640	.0635	.0610	2004
2000	.0650	.0620	.0610	.0590	.0580	.0570	2005
2001	.0600	.0575	.0560	.0540	.0530	.0520	2006
2002	.0550	.0530	.0510	.0500	.0510		
2003	.0500	.0480	.0490	.0500			
2004	.0450	.0470	.0495				
2005	.0500	.0535					
2006	.0550						

66. If a fund credits interest using the investment year method, how much will 200 invested on January 1, 1995 accumulate to on January 1, 2005?
67. If a fund credits interest on the portfolio approach, calculate the accumulated value as of December 31, 2006 of 1000 invested on January 1, 2001.
68. A fund credits interest using the investment year method. Kayla invests 100 on January 1, 2002. She also invests 300 on January 1, 2004. Calculate how much she will have on December 31, 2005.
69. Number 1 in the Book

Answers

64. See Book
65. See Book
66. 407.91
67. 1436.53
68. 450.83
69. See Book