Name: _____ Date: _____

MA 162

Week 14 Recitation Worksheet (Tuesday)

You must show all work to receive full credit.

With simple interest, you only earn interest on the principal (amount borrowed or invested). Often times, the interest earned on an investment is reinvested, allowing one to earn interest on interest. This is called **compound interest**. If an amount P is invested at an annual interest rate r, compounded n times per year, then after t years the accumulated value A is

$$A = P\left(1 + \frac{r}{n}\right)^{nt}.$$

1. (HW18 #2) If you invest \$3,953.47 in an account earning an annual interest rate of 2.576% compounded weekly, how much will be in your account after 2 years?

2. (HW18 #4) A mutual fund pays 10% compounded monthly. How much should I invest now so that 2 years from now I will have \$4500 in the account?

3. (HW18 #8) If you make a deposit into a bank account, at what interest rate, compounded monthly, should you invest if you would like to double your investment in 40 months?

When interest is compounded "infinitely many times" per year, it is said to be *compounded continuously*. In this case, the accumulated value A of an amount P invested at an annual interest rate r for t years is

$$A = Pe^{rt}.$$

4. (HW18 #5) John wants to buy a new sports car, and he estimates that he'll need to make a \$4,525.00 down payment towards his purchase. If he has 32 months to save up for the new car, how much should he deposit into his account if the account earns 5.976% compounded continuously so that he may reach his goal?

5. (HW18 #6) Suppose you invest \$16,900.00 into an account earning an interest rate of 2.257% compounded continuously for 1 year and thereafter earning an interest rate of 4.164% compounded weekly. How much money is in the account after 12 years?

If given the option of two interest rates compounded over different periods of time, how do you know which is better?

6*. (HW18 #9/10) Find the *effective rate of interest* for

(a) 5% compounded semiannually.

(b) 4% compounded continuously.

With both simple interest and compound interest, the amount of money deposited was a lump sum and was left to accumulate interest. We will now consider a few examples in which *payments are made on a regular basis into an account*. An **annuity** is a sequence of equal payments made at equal intervals of time. We will only consider *ordinary annuities*, meaning that the payments are made at the end of each period. We will also assume the frequency of payments is the same as the frequency of compounding interest. If a payment R is deposited at the end of each compounding period into an account earning an annual interest rate r for t years, then the accumulated value (or future value) A of the annuity is

$$A = R\left[\frac{(1+\frac{r}{n})^{nt}-1}{\frac{r}{n}}\right],$$

where n is the number of compounding periods per year.

7. (HW19 #1) If you make quarterly payments of \$454.00 into an ordinary annuity earning an annual interest rate of 6.92%, how much will be in the account after 5 years?

8. (HW19 #2) If you make monthly payments of \$497.00 into an ordinary annuity earning an annual interest rate of 4.79% compounded monthly, how much will you have in the account after 3 years?

9*. (HW19 #3) If you make quarterly deposits of $378.00 into an ordinary annuity earning an annual interest rate of 4.35%,

(a) how much will be in the account after 6 years?

(b) How much interest did you earn in those 6 years?

10. (HW19 #4) How much do you need to invest semiannually into an ordinary annuity earning an annual interest rate of 6.32% compounded semiannually so that you will have $6,106.91 after 8 years?

11. (HW19 #5) In 5 years Harry and Sally would like to have $26,000.00 for a down payment on a house. How much should they deposit each month into an account paying 14% compounded monthly?

12*. (HW19 #6) Irene plans to retire on December 31st, 2019. She has been preparing to retire by making annual deposits, starting on December 31st, 1979, of $2450 into an account that pays an effective rate of interest of 9%. She has continued this practice every year through December 31st, 2000. Her goal is to have $1.45 million saved up at the time of her retirement. How large should her annual deposits be (from December 31st, 2001 until December 31st, 2019) so that she can reach her goal?