Compound Interest

1. Suppose $10,000 is deposited in an account that pays interest at the rate of 6% per year. We consider what happens to the value of the account in 10 years under various compounding schemes under the assumption that no further deposits or withdrawals are made.

   a. Compound at the end of each year.

   b. Compound monthly.

   c. Compound weekly

   d. Compound daily.

2. Suppose $y = (1 + \frac{1}{x})^x$. Complete the following table.

x	1	3	6	9	10	100	1000	10,000	100,000
y									

In this case we say that the value of y approaches _______ as x becomes infinitely large.

Where _____ ≈ ________

3. Suppose an initial amount A is deposited in an account that pays interest at rate r per annum compounded n times per year. What function will tell us the value of the account t years in the future? (Assume there are no further deposits or withdrawals.)

   We denote the value of the account t years in the future by V(t).

$$V(t) = A(1+\frac{r}{n})^{nt}$$

Working with the formula above we observe that

$$V(t) = A(1+\frac{r}{n})^{nt} = A\left[\left(1+\frac{1}{\left(\frac{n}{r}\right)}\right)^{\left(\frac{n}{r}\right)}\right]^{rt}$$

For any fixed value of r, what happens to the value of $\frac{n}{r}$ as n becomes very large?

So, what can we say about the value of $\left[\left(1+\frac{1}{\left(\frac{n}{r}\right)}\right)^{\left(\frac{n}{r}\right)}\right]$ as $\frac{n}{r}$ becomes very large?

Hence, for very large values of *n,*

$$V(t) = A(1+\frac{r}{n})^{nt} \approx A(\_\_)^{rt}.$$