Honors Algebra 2/Trig **4.1 Notes** **Name:**

Suppose you get a credit card when you turn 18 years old. The credit card has a credit limit of $800 with 20% APR (interest rate) that accrues monthly. You max out the credit card, then lose your job and can't pay anymore.

- How much do you owe after 1 month?
- How much after 1 year?
- How much after 2 years?
- How much after 3 years?
- How much after t years?

Compound interest: $A = P\left(1+\frac{r}{n}\right)^{nt}$, where P is the principal, r is the ***annual*** interest rate, n is the number of compounds per year, and t is the number of years.

Example: You invested $12,000 at an annual interest rate of 9%. Find the balance after 5 years if the compounded

a) yearly:

b) monthly:

c) daily:

In today's lesson, we introduced interest compounded n times per year, However, in population models, the rate of population change is compounded infinitely many times per year.

Since the only part of the formula $A = P\left(1+\frac{r}{n}\right)^{nt}$ with an *n* in it is the $\left(1+\frac{r}{n}\right)^{n}$, let's analyze the value of $\left(1+\frac{1}{n}\right)^{n}$ as *n* goes to infinity.

1. Using a calculator, evaluate the function $f(x) = \left(1+\frac{1}{x}\right)^{x}$ for the values of *x* in the table. Round $f(x)$ to six decimal places.

2. Describe the behavior of $f(x)$ as *x* increases. Be as descriptive as possible based on what you see.

x	$f(x)$	x	$f(x)$
1		50	
2		100	
3		1,000	
4		10,000	
5		100,000	
10		1,000,000	

3. To what number does $f(x)$ appear to approach? _____

4. Evaluate **e[1]** on your calculator and record the number here: _____
(On TI calculators, press `2nd` >> `LN` >> `1` >> `ENTER`)

5. Graph $f(x)$ and $g(x) = e^{1}$ on your calculator. What conclusion can you draw about the ***horizontal asymptote*** of $f(x)$? (i.e., the value $f(x)$ approaches as *x* approaches ∞).

Example: You invested $12,000 at an annual interest rate of 9%. Find the balance after 5 years if the compounded continuously.