Name: ______________________ **Precalculus Unit 8, Lesson 5**

Aim: What is the base of the natural logarithmic function?

I. Do Now:

1. Solve for x:

$$\log_2\left(x^2-12\right)=3+\log_2\left(1-x\right)$$

2. Evaluate:

$$\sum_{n=0}^{7}\frac{1}{n!}$$

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

where A = final amount (balance)
P = principal (money invested)
r = interest rate (6% = 0.06)
t = time, in years
n = # of times compounded per year

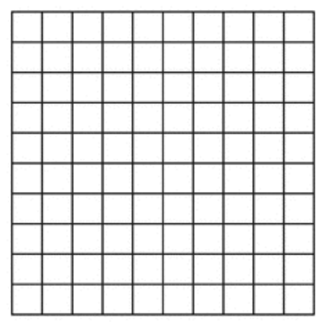
3. Use the formula above to answer the following questions:
   (a) Muhammad deposits \$1 in an account at a very generous bank that that pays him a mind-boggling 100% annual interest. Assuming no other deposits and withdrawals, what will his balance be in one year if the interest is compounded:
   (i) annually? (ii) semi-annually? (iii) quarterly? (iv) monthly?

   (b) What do you notice?

   (c) Write a function that gives the balance after the interest is compounded n times in one year.

   (d) Will Muhammad's ending balance (after 1 year) ever exceed \$3?

II. Development:



III. Examples: Solve for x.

4. $e^x=30$ 5. $e^{2x}+1=11$ 6. $\ln x+3=5$ 7. $\ln x+\ln(x+2)=\ln 35$

IV. Applications:

With continuous compounding of interest or continuous exponential growth, we the formula $A=Pe^{rt}$ instead of the usual compound interest formula $A=P\left(1+\frac{r}{n}\right)^{nt}$.

8. How much will a \$100 deposit earning 6% interest, compounded monthly, yield in 5 years?

9. How much will a \$100 deposit earning 6% interest, compounded continuously, yield in 5 years?

10. A population of fruit flies is best estimated by the function $f(t)=200e^{0.05t}$, where t represents the time in minutes.
    (a) What is the fruit fly population initially?

    (b) What is the population after 5 minutes?

    (c) How many minutes will it take for the fruit fly population to exceed 1,000?

HW12
p. 200: 77, 78
p. 207: 20, 56, 62, 77, 80
p. 217: 45, 61, 63, 109