9.5 Base e and Natural Logs Algebra 2 Trig

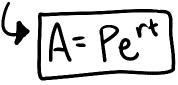
to the amount base

on the number o

compoundings

The other day, we compared different compoundings of a \$1000 investment with a 1.5% annual interest rate. After 2 years of growth we get the following results: * There's a limit

- Compounded **annually**: $y = 1000(1+.015)^2 = 1030.22
- Compounded **quarterly**: $y = 1000 \left(1 + \frac{.015}{4}\right)^8 = 1030.39
- $y = 1000 \left(1 + \frac{.015}{12}\right)^{24} = 1030.43 Compounded **monthly**:
- $y = 1000 \left(1 + \frac{.015}{365}\right)^{730} = 1030.45 Compounded daily:
- Compounded continuously: $y = 1000 e^{-0.5(2)} = (41030.45)$



A= Pert A= Ending acct value P= Principal r= rate (in decimal)

Base e and Natural Logs

e is an irrational number like pi

$$e = 2.71828...$$

A <u>logarithm</u> with a <u>base of e</u> is called a <u>natural logarithm</u>

$$\log_e x = \ln x$$

1) Rewrite in exponential form.

2) Rewrite in logarithmic form.

a)
$$e^3 \approx 20.09$$

log. 20.09 \(\times 3 \)

b)
$$\ln e = 1$$
 $\log_e e = 1$

b)
$$e^{-2} \approx 0.135$$

 $\log_e 0.135 \approx -2$
 $10.135 \approx -2$

3) Solve for x.

a)
$$x = \ln e^4$$

 $x = \log_e e^4$
 $x = \log_e e^4$

4) Use the formula $A = Pe^{rt}$ where A is the amount in the account after t years. P is the principal (the original amount) and r is the annual interest rate (in decimal form).

Suppose you deposit \$3000 in an account paying 2.8% annual interest compounded continuously.

a) What is the balance after 8 years?
$$A = 3000e^{.028(3)}$$

$$A = 43753.21$$

b) How long will it take for the balance of the account to double?