Warm-up

1) $5\log_6 36$

2) $\log_5 125$

3) $2\log_3 9$

The Natural Base, e

7.6

The ***compound interest formula*** is $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

If \$27 is invested at 50% interest compounded *3* times for *2* year, the function represented would be $A =$

Suppose that \$1 is invested at 100% interest compounded *n* times for *t* year, the function represented would be $A = \left(1 + \frac{1}{n}\right)^{n}$

There is a number that is represented by this function known as *e*.
e is an irrational constant like π.

e is approximately 2.7182818.

$$e = \left(1 + \frac{1}{n}\right)^n$$

The ***compound interest formula*** is $A = P\left(1 + \frac{r}{n}\right)^{nt}$.

Here is the shorter version of the compound interest formula $A = Pe^{rt}$

I Try:

What is the total amount for an investment of $1000 invested at 5% for 10 years compounded continuously?

Find the givens A, P, R, T	A=? P=1000 R=.05 T=10
Plug into $A = Pe^{rt}$	$A = 1000e^{(.05)(10)}$
Simplify	$A = 1000e^{.5}$ A=$1000(1.64872)$ $A = 1648.72$

We Try:

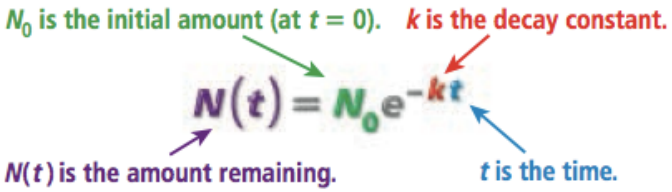
What is the total amount for an investment of $9876 invested at 2% for 8 years compounded continuously?

Find the givens A, P, R, T	A=? P= R= T=
Plug into $A = Pe^{rt}$	$A =$
Simplify	$A =$

You Try with your partner on whiteboards:
Odd Talk, Even Write
What is the total amount for an investment of $1234 invested at 5% for 6 years compounded continuously?

Find the givens A, P, R, T	A=? P= R= T=
Plug into $A = Pe^{rt}$	$A =$
Simplify	$A =$

The *half-life* of a substance is the time it takes for half of the substance to breakdown or convert to another substance during the process of decay. Natural decay is modeled by the function below.



I try:

A paleontologist uncovers a fossil of a saber-tooted cat in California. He analyzes the fossil and concludes that the specimen contains 15% of its original carbon-14. Carbon-14 has a half-life of 5730 years. Use carbon-14 dating to determine the age of the fossil.

$$N(t) = N_o e^{-kt}$$

First find the half life decay constant, k.	N(t)=1/2 N_o=1 5730=t $\frac{1}{2} = 1e^{-k(5730)}$
Solve for k.	$\ln\left(\frac{1}{2}\right) = \ln(e^{-5730k})$ $\ln(2^{-1}) = -5730k$ $-ln2 = -5730k$ $k = \frac{ln2}{5730}$ k=.00012
Find the decay function Plug in givens.	$N(t) = N_o e^{-kt}$ N(t)=.15 $N_o = 1$ K=.00012 $.15 = 1e^{-.00012t}$ $ln.15 = lne^{-.00012t}$

	$ln.15 = -.00012t$
Solve for t	$t = ln.\frac{15}{-.00012}$= 15,809 years.

A logarithm with a base of e $(\log_e)$ is called a natural logarithm and is abbreviated as “ln”.

The natural logarithmic function $f(x) = lnx$ is the inverse of $f(x) = e^x$

Desmos.com
What is the domain and range?

Simplifying Expressions with e

lne^{-2t}

$e^{\ln(t-1)}$

e^{5lnx}

We Try:

1) $lne^{3.2}$

2) e^{2lnx}

3) lne^{x+4y}

You Try on Whiteboards:

1) lne^{5}

2) lne^{x-y}

3) e^{3lnx}