Name: _____ **AP**

CLASSWORK 66

1. Can we **proove** that the derivative of ln x is 1/x ?

We need these properties of logarithms and natural logarithms:

1) $\log a - \log b = \log (a/b)$ 2) $\log (a^b) = b \cdot \log a$

We also need to remember the **definition** of e:

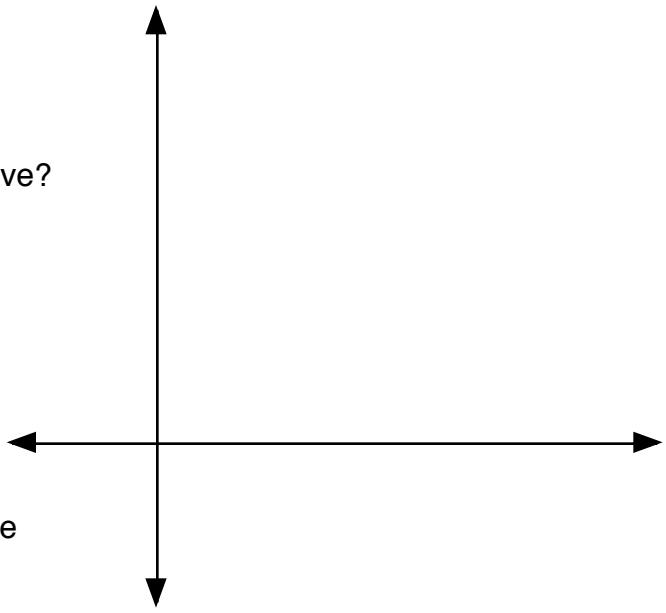
2. Sketch a graph of the function $y = e^x$ on the axes below.

a) Why does the function never hit zero?

b) Where is the derivative positive? Where is it negative?

c) Where is the derivative the smallest?
Where is the derivative the highest?

d) Use this information to sketch a graph of the derivative on the same axes.



3. Let's investigate the derivative of $y = e^x$ with numerical methods.

x	$f(x) = e^x$	2nd point near x	Δy	Δx	slope over the interval	x
-1		(-1.01,)				-1
-0.5		(-.51,)				-0.5
0		(.01,)				0
0.5		(.51,)				0.5
1		(1.01,)				1
2		(2.01,)				2
3		(3.01,)				3
4		(4.01,)				4

What is the derivative of $y = e^x$? Use the calculator to show you are right.

4. Find the derivative of $y = x\, e^x$

5. Find the derivative of $y = e^x + \ln x$

6. Find the derivative of $y = \sin x \cdot e^x$

7. Find the derivative of each function in the chart below using the product rule. What pattern do you notice?

function	derivative	function	derivative
$y = e^x$		$y = (e^x)^2$	
$y = \sin x$		$y = \sin^2 x$	
$y = \ln x$		$y = (\ln x)^2$	
$y = \cos x$		$y = \cos^2 x$	
$y = e^x$		$y = (e^x)^3$	
$y = \sin x$		$y = \sin^3 x$	
$y = \ln x$		$y = (\ln x)^3$	
$y = \cos x$		$y = \cos^3 x$	
$y = e^x$		$y = (e^x)^4$	
$y = \sin x$		$y = \sin^4 x$	
$y = \ln x$		$y = (\ln x)^4$	
$y = \cos x$		$y = \cos^4 x$	