CLASSWORK 64

1. Find the value of each expression.

a) $\log_3 81 =$ b) $\log 0.1 =$ c) $\ln 7 =$ d) $\ln \sqrt{e} \; =$

2. a)   Find the slope of $y = \ln x$ at $x = 4$.

b) Show that your answer is correct by graphing the original function and the tangent line. The y-intercept of the tangent line is 0.3863.

3. When does $y = \ln x$ have a slope of 2.5?

4. a) Find the derivative of $y = x \cdot \ln x$

   b) Use nDeriv on the calculator and check if that function matches your answer.

c) Use the derivative to find the slope of the graph at $x = 3$

d) Find the slope of the function over the interval between $x = 3$ and $x = 3.001$

5.   a) Find the derivative of $y = \dfrac{\ln x}{x}$

   b) Use the nDeriv function on the calculator to check your answer.

6.   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) $\log(a^b) = b \cdot \log a$

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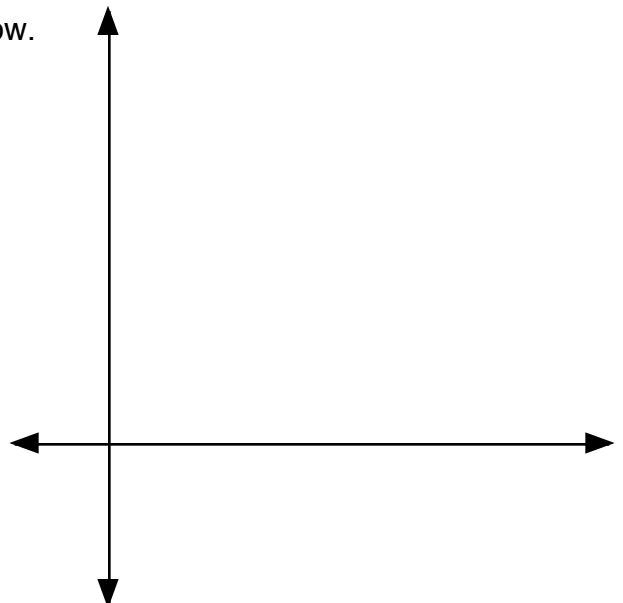
We also need to remember the **definition** of e:

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

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

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

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

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

x	$f(x) = e^x$	2nd point near x	Δ y	Δ x	slope over the interval
-1		(-1.001,)			
-0.5		(-.501,)			
0		(.001,)			
0.5		(.501,)			
1		(1.001,)			
2		(2.001,)			
3		(3.001,)			
4		(4.001,)			

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