Name: _____

CLASSWORK 62

1. Find the derivative using the product rule and then **simplify** to check your answer.

PRODUCT RULE SIMPLIFY/OLD WAY

a) $y = (x + 2)(4x^2)$

b) $y = (3x^{-4})(2x^{-2})$

2. A function $y = (2x + 1)x^2$

a) Find the derivative of the function using the product rule.

b) Find the derivative of the function by simplifying it and taking the derivative normally.

REALITY CHECK:

c) Find the slope of the function at $x = 3$

d) Find the **slope** over the interval between $x = 3$ and $x = 3.001$ to show this is correct.

3. Find the derivative of $y = x^2 \cos x$

4. A new topic..... Find **(USE x instead of n)**

$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$ using the calculator. What will the part inside the parentheses approach?

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

What will the exponent approach?

Why are these two in conflict?

What is this special limit?

5. Find the following sum to the 5th decimal place:

$$\frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \frac{1}{5!} + \frac{1}{6!} + \frac{1}{7!} \ldots$$

6. A little reminder.... Find the answer to each of these logarithmic expressions.

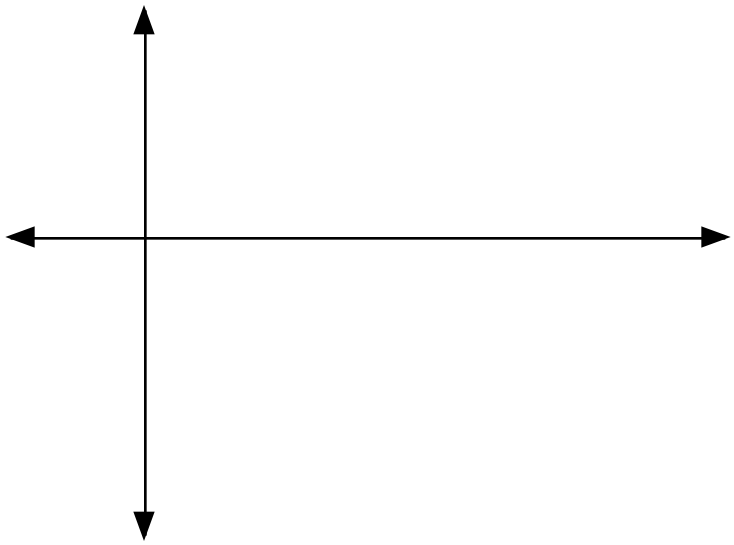
$\log_2 8 =$ $\log_5 25 =$ $\log_{10} 1{,}000{,}000 =$

e is such a special number that there is a special function defined as the log with base e ($\log_e$) of a number.

7. Use the calculator to evaluate the following expressions. Then raise **e** to the answer power to show that your answer is correct.

a) ln 5 = b) ln 10 = c) ln 20 = d) ln 100 =

8. Sketch a graph of $y = \ln x$.



a) What is the value of the function at $x = 0$?

Why does this make sense?

b) Why doesn't the function exist for $x < 0$?

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

d) Where is the derivative the highest? The lowest?

e) Does the slope of the function decrease or increase as x increases?

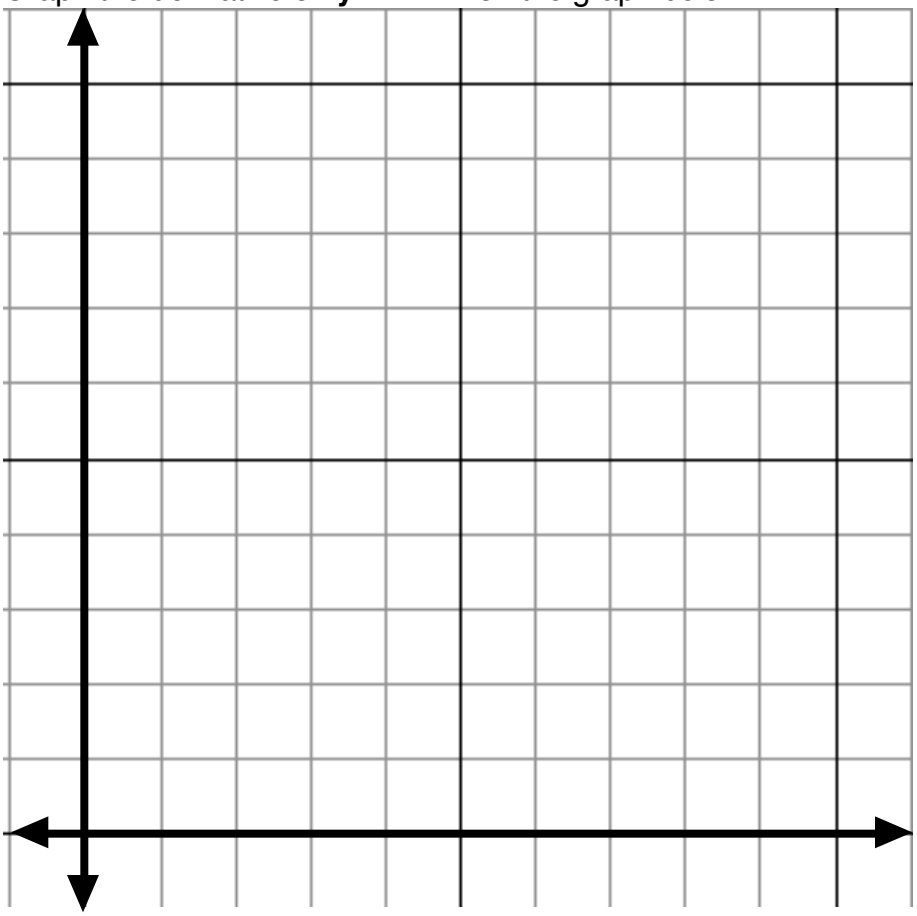
In other words, the second derivative is... the curvature is...

Sketch the derivative of the function on the same axes above.

9. Let's investigate the derivative of **y = ln x** more closely. We're going to use small intervals to approximate the derivative at different points.

x	f(x)	2nd point near x	Δ y	Δ x	slope over the interval	x
10		(10.001,)				10
5		(5.001,)				5
4		(4.001,)				4
3		(3.001,)				3
2		(2.001,)				2
1		(1.001,)				1
.5		(0.5001,)				.5
.25		(0.2501,)				.25
.2		(0.2001,)				.2
.1		(0.1001,)				.1

Graph the derivative of **y = ln x** on the graph below.



What is the derivative of y = ln x ? Use the calculator to check this answer.