Math 1220 #3

The Natural Exponential Function

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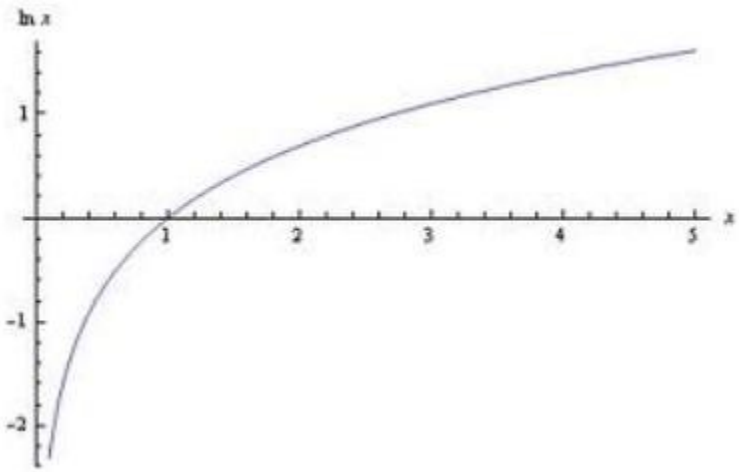
Remember the graph of $y = \ln\ x$.

It is strictly monotonic, so it has an inverse function.



Draw it.

Domain:
Range:

Let's call the inverse function "exp."

$$\ln\ (\exp\ (x)) =$$
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Definition

Let e be a real number such that $\ln\ e = 1$.

$$r \in \mathbb{R}, \exp\ (r) = \exp\ (r \ln\ e) \text{ since } \ln\ e = 1$$

Theorem

Let a and b be real numbers. Then $e^a e^b = e^{a+b}$ and $\frac{e^a}{e^b} = e^{a-b}$

Proof:

How do we take a derivative?
Let $y = e^x \Leftrightarrow \ln\ y = x$

EX 1

Find y'.

$$y = e^{x^2-3x}$$

EX 2

Find y'. $y = e^{\sqrt{x}\ln x}$

EX 3

For $f(x)$ analyze the graph. (I.e. min, max, concavity, inflection pts, sketch.)
$f(x) = e^x - e^{-x}$

Since $D_x[e^x] = e^x$, then $\int e^x dx = e^x + C$.

EX 4

Evaluate these integrals.

4a)

$$\int e^{-6x} dx$$

4b)

$$\int e^{(x+e^x)} dx$$

4c)

$$\int \frac{e^{3/x}}{x^2} dx$$