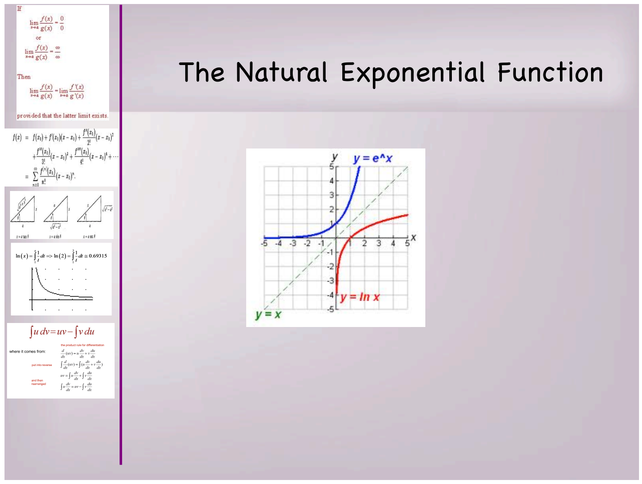
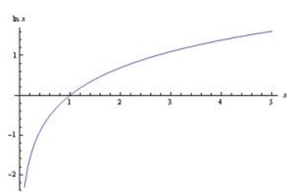


The Natural Exponential Function

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 $ln\, e = 1$.

$r \in \mathbb{R}$, $exp(r) = exp(r\, ln\, e)$ 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 $y = e^x \iff \ln y = x$

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

EX 4 Evaluate these integrals.

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

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

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