

Lecture 18

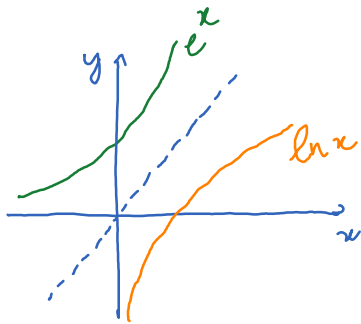
Thursday, February 9, 2023 8:22 AM

* Questions....

* The exponential function e^x is the inverse of the logarithm function.

$$e^{\ln x} = x$$

$$\ln e^x = x$$



Behavior: • increasing

$$\bullet \lim_{x \rightarrow -\infty} e^x = 0$$

$$\bullet \lim_{x \rightarrow \infty} e^x = \infty$$

$$\bullet e^0 = 1 \text{ because } \ln e^0 = 0$$

• grows to ∞ very fast as $x \rightarrow \infty$

• decays to ∞ very fast as $x \rightarrow -\infty$

Algebraic properties:

$$e^{x+y} = e^x e^y$$

$$e^{-x} = \frac{1}{e^x}$$

$$e^0 = 1$$

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

$$e^{ax} = (e^x)^a$$

Derivatives : $\ln e^x = x$

Differentiate:

$$\underbrace{(\ln e^x)' = x' = 1}_u$$
$$\frac{u'}{u}$$

$$\leadsto u' = u \leadsto \boxed{(e^x)' = e^x}$$

$$(e^u)' = u' e^u$$

Ex Find the derivative of $e^{\sin x}$, $\ln(e^x - 1)$.

Find the domain of $\ln(e^{2x} - 3e^x + 2)$.