141-012

Wednesday, October 10

TEST #2 (first hour)

SECOND HOUR ↓

CH2:

$y = e^x$

$y' = e^x$

$y = e^x = \exp(x)$

chain rule:

$y = e^u \qquad y' = e^u \cdot du$

$y = e^{f(x)} \qquad y' = e^{f(x)} \cdot f'(x)$

$y = e^{5x} \qquad y' = e^{5x} \cdot (5) = 5 \cdot e^{5x}$

$y = e^{3x^2+x+1} \qquad y' = e^{3x^2+x+1} \cdot (6x+1)$

$y = e^{x^2} \qquad y' = e^{x^2} \cdot (2x)$

$y = e^{1/x} \qquad y' = e^{1/x} \cdot (-1x^{-2}) = e^{1/x} \cdot \frac{-1}{x^2}$

$y' = -\frac{e^{1/x}}{x^2}$

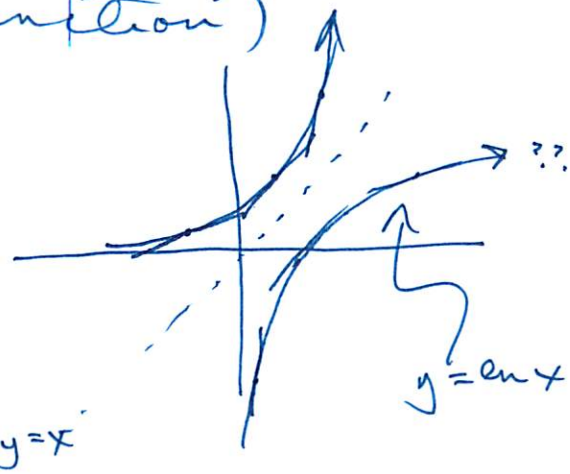
$y = e^x$ (natural exponential function)

INVERSE:

* $x = e^{y}$

solve for y:

y is the power to which "e" is raised to get x



$y = \boxed{\log_e} x \longrightarrow \boxed{y = \ln x}$

natural log.

rewrite:

$e^y = x$

$y = \ln x$

find y':

rewrite:

$e^y = x$

DERIV:

$e^y \cdot \frac{dy}{dx} = 1$

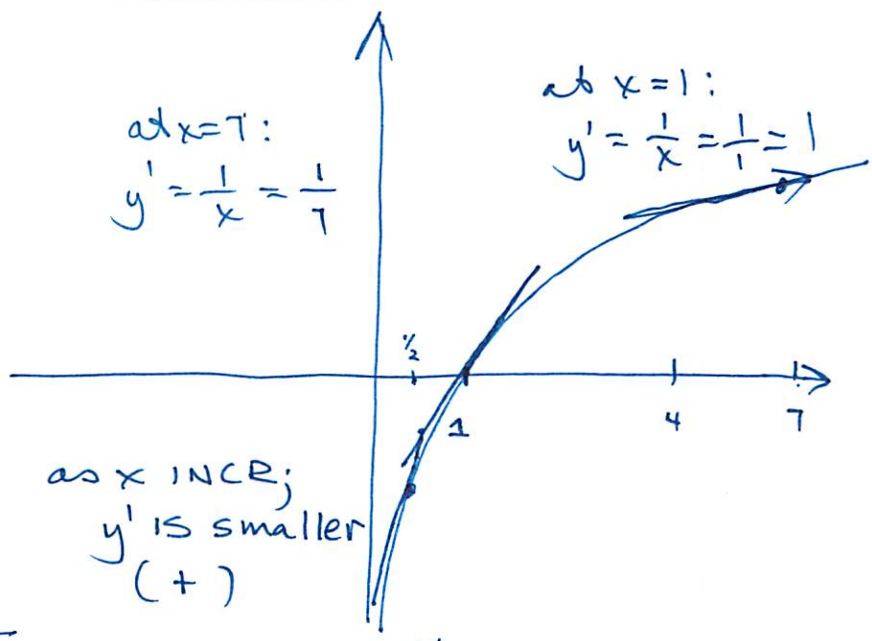
$\frac{dy}{dx} = \frac{1}{e^y}$

$\frac{dy}{dx} = \frac{1}{x}$

at $x=7$:
$y' = \frac{1}{x} = \frac{1}{7}$

at $x=1$:
$y' = \frac{1}{x} = \frac{1}{1} = 1$

as x INCR;
y' IS smaller
(+)



at $x=\frac{1}{2}$:
$y' = \frac{1}{x} = \frac{1}{1/2} = 2$

$y = \ln x \quad y' = \frac{1}{x}$

chain rule:

$y = \ln u \quad y' = \frac{1}{u} \cdot du$

$y = \ln[f(x)] \quad y' = \frac{1}{f(x)} \cdot f'(x)$

ex: $y = \ln[2x]$

$y' = \frac{1}{2x} \cdot 2 = \frac{1}{x}$

$y = \ln(2x) = \underline{\ln 2} + \underline{\ln x}$

$y' = 0 + \frac{1}{x} =$

$\ln_e 8 = 2.079$

$\rightarrow [e^{2.079} = 8]$

$\ln_e e^2 = 2$

$e^? = e^2$

$y = e^x$ | $y = \ln x$

$y' = e^x$ | $y' = \frac{1}{x}$

chain rule:

$y = \ln(x^2+5x)$

$y' = \frac{1}{x^2+5x} \cdot (2x+5)$

$y' = \frac{2x+5}{x^2+5x}$

$y = \ln u$

$y' = \frac{1}{u} \cdot du$

$y' = \frac{du}{u}$

$y = a^x$ ex: $y = 2^x$; $y = 5^x$; $y = 10^x$

$[e^{\ln 8} = 8]$ $e^{\ln u} = u$

$\ln 2^3 = 3\ln 2$

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

rewrite: $y = e^{\ln a^x} = e^{x \cdot \ln a}$

$y = e^{x \cdot \ln a}$

$y' = e^{x \cdot \ln a} \cdot d(x \cdot \ln a)$

$y' = e^{x \cdot \ln a} \cdot \ln a$

$y' = a^x \cdot \ln a$

$y = a^x \qquad y' = a^x \cdot \ln a$

ex: $y = 5^x$

$y' = 5^x \cdot \ln 5$

$y = 8^{x^2}$

$y' = 8^{x^2} \cdot \ln 8 \cdot (2x)$

$y = 8^{x^2+3x-1}$

$y' = 8^{x^2+3x-1} \cdot \ln 8 \cdot (2x+3)$

INVERSE OF $y = a^x$

$\boxed{x = a^y}$ $=$

$y = \log_a x$

DERIV: $1 = a^y \cdot \ln a \cdot \dfrac{dy}{dx}$

$\dfrac{1}{a^y \cdot \ln a} = \dfrac{dy}{dx}$

$\dfrac{1}{x \cdot \ln a} = \dfrac{dy}{dx}$

$$y = \log_{10} x$$

$$y' = \frac{1}{x \cdot \ln 10}$$

$$y = \log_{10} \underbrace{(x^2 - 3x + 5)}$$

$$y' = \frac{1}{(x^2-3x+5) \cdot \ln 10} \cdot \underbrace{(2x-3)}$$

1^{∞}

DEF:

$$\boxed{e = \lim_{x \to \infty} \underbrace{\left(1 + \frac{1}{x}\right)}^{x}}$$

$(e \approx 2.718)$

$x = 1000$

$$\left(1 + \frac{1}{1000}\right)^{1000} \approx 2.716$$

$x = 1{,}000{,}000$

$$\left(1 + \frac{1}{1{,}000{,}000}\right)^{1{,}000{,}000} \approx 2.718$$