

$$\frac{d}{dx}(\ln x) = \frac{1}{x} \quad \frac{d}{dx}(e^x) = e^x$$

$$\frac{d}{dx}(a^u) = a^u \cdot \ln a \cdot \frac{du}{dx} \quad \frac{d}{dx}(e^u) = e^u \cdot \frac{du}{dx}$$

$$\frac{d}{dx}(\log_a u) = \frac{1}{u \ln a} \cdot \frac{du}{dx}$$

p. 178 #18

$$y = \ln(10/x)$$

$$y' = \frac{x}{10} \cdot \frac{-10}{x^2}$$

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

inside:

$$\frac{d}{dx}(10x^{-1})$$

$$= -10x^{-2}$$

$$= -\frac{10}{x^2}$$

12. $y = 9^{-x} \quad -9^{-x} \ln 9$

14. $y = 3^{\cot x} \quad -3^{\cot x} (\ln 3) (\csc^2 x)$

16. $y = (\ln x)^2 \quad \frac{2 \ln x}{x}$

18. $y = \ln(10/x) \quad \text{See page 180.}$

20. $y = x \ln x - x \quad \ln x$

22. $y = \log_5 \sqrt{x} \quad \text{See page 180.}$

24. $y = 1/\log_2 x \quad \frac{1}{x(\ln 2)(\log_2 x)^2}$

26. $y = \log_3(1 + x \ln 3)$

22

$$y = \log_5 \sqrt{x}$$

$$y' = \frac{1}{\sqrt{x} \cdot \ln 5} \cdot \frac{1}{2\sqrt{x}}$$

$$= \frac{1}{2x \ln 5}$$

inside

$$\frac{d}{dx} (\sqrt{x})$$

$$\frac{1}{2} x^{-1/2} = \frac{1}{2\sqrt{x}}$$

$$\text{change of base: } \log_5 x = \frac{\ln x}{\ln 5}$$

$$\left\{ \begin{array}{l} \log a + \log b = \log(ab) \\ \text{rule - any base} \\ \log a - \log b = \log\left(\frac{a}{b}\right) \end{array} \right.$$

$$10^3 = 1000 \iff \log 1000 = 3$$

$$e^1 = e \iff \ln e = 1$$

$$5^3 = 125 \iff \log_5 125 = 3$$

#15 $y = e^{1+\ln x}$ find $\frac{dy}{dx}$

$$\frac{dy}{dx} = e^{1+\ln x} \cdot \frac{1}{x}$$

inside: $1+\ln x$
(u)

outside: exp.

$$a^m \cdot a^n = a^{m+n}$$

$$= e' \cdot e^{\ln x} \cdot \frac{1}{x}$$

$$= e \cdot x \cdot \frac{1}{x} = e$$

(y =) e^x

input: x
("inside")

(y =) $e^{1+\ln x}$

input to
 e^{\square} fcn?

: $1+\ln x$
(inside)

