Section 3.3 - derivatives of logarithmic functions

- $\frac{d}{dx} \log_a x = \frac{1}{x \ln a}$
- $\frac{d}{dx} \ln(x) = \frac{1}{x}$
- $\frac{d}{dx} \ln[u(x)] = \frac{u'(x)}{u(x)}$
- $\frac{d}{dx} \ln|x| = \frac{1}{x}$

Logarithmic Differentiation

1. take ln of both sides
2. simplify out logs
3. differentiate implicitly & $\frac{d}{dx}$ ln rules
4. solve for $\frac{dy}{dx}$

- can use as slope of a tangent line

Express e as a limit → we know $\ln e = 1$ but we can write it as a limit too

- $\lim_{h \to 0} (1+h)^{1/h} = e$
- $\lim_{n \to \infty} \left(1 + \frac{1}{n}\right)^n = e$

ex: $\lim_{h \to 0} (1+2h)^{1/h}$ $\quad (1+2h)^{1/h} = \left[(1+2h)^{1/2h}\right]^2$ $\quad \frac{2}{2h} = \frac{1}{h}$ $\quad K = 2h$

$\lim_{K \to 0} \left[(1+K)^{1/K}\right]^2 = e^2$