

section 1

$$\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}} \rightarrow \exp(1)$$

$$\lim_{x \rightarrow 0} (1-x)^{\frac{1}{x}} \rightarrow \exp(-1)$$

$$\lim_{x \rightarrow 0} (1-x)^{\frac{-1}{x}} \rightarrow \exp(1)$$

$$\lim_{x \rightarrow 0} (1+x)^{\frac{-1}{x}} \rightarrow \exp(-1)$$

$$\lim_{x \rightarrow 0} (1-3x)^{\frac{2}{x}} \rightarrow \exp(-6)$$

$$\lim_{x \rightarrow 0} (1+3x)^{\frac{2}{x}} \rightarrow \exp(6)$$

$$\lim_{x \rightarrow 0} \left(\frac{1+3x}{1-2x} \right)^{\frac{2}{x}} \rightarrow \exp(10)$$

$$\lim_{x \rightarrow 0} \left(\frac{3+x}{3-x} \right)^{\frac{1}{x}} \rightarrow \exp\left(\frac{2}{3}\right)$$

section 2

$$\lim_{x \rightarrow 0} (\cos(x))^{\frac{1}{x^2}} \rightarrow \exp\left(\frac{-1}{2}\right)$$

$$\lim_{x \rightarrow 0} (\cos(2x))^{\frac{3}{x^2}} \rightarrow \exp(-6)$$

$$\lim_{x \rightarrow 0} \left(\frac{\tan(x)}{x} \right)^{\frac{3}{x^2}} \rightarrow \exp(1)$$

$$\lim_{x \rightarrow 0} \left(\frac{\sin(x)}{x} \right)^{\frac{5}{2}} \rightarrow \exp\left(\frac{-5}{6}\right)$$

section 3

$$\lim_{x \rightarrow 0} \frac{\ln(1+x)}{x} \rightarrow 1$$

$$\lim_{x \rightarrow 0} (1 + \ln(1+x))^{\frac{1}{x}} \rightarrow \exp(1)$$

$$\lim_{x \rightarrow 0} (1 + \ln(1+x))^{\frac{1}{\ln(1+x)}} \rightarrow \exp(1)$$

$$\lim_{x \rightarrow 0} \frac{\ln(1+3 \cdot x)}{\ln(1+2 \cdot x)} \rightarrow \frac{3}{2}$$

$$\lim_{x \rightarrow 0} (1+x)^{\frac{1}{\ln(1+x)}} \rightarrow \exp(1)$$

section 4

$$\lim_{x \rightarrow 0} \left(1 + \frac{1}{x}\right)^x \rightarrow 1$$

$$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x \rightarrow \exp(1)$$

$$\lim_{x \rightarrow \infty} \left(1 - \frac{2}{x}\right)^x \rightarrow \exp(-2)$$

$$\lim_{x \rightarrow \infty} \left(\frac{x+1}{x-1}\right)^x \rightarrow \exp(2)$$

$$\lim_{x \rightarrow \infty} \left(\frac{2x+1}{2x-3}\right)^x \rightarrow \exp(2)$$

$$\lim_{x \rightarrow \infty} \left(\frac{x^2+x+1}{x^2-x+1}\right)^x \rightarrow \exp(2)$$

$$\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x^2}\right)^{x^2} \rightarrow \exp(1)$$

$$\lim_{x \rightarrow \infty} \left(\cos\left(\frac{3}{\sqrt{x}}\right)\right)^x \rightarrow \exp\left(\frac{-9}{2}\right)$$

$$\lim_{x \rightarrow \infty} \left(1 + \sin\left(\frac{2}{x}\right)\right)^x \rightarrow \exp(2)$$

section 8

$$f(x) := x + 2 \cdot x^2 \quad g(x) := 2 \cdot x - x^2 \quad fg(x) := (2 \cdot x - x^2) + 2 \cdot (2 \cdot x - x^2)^2 \quad (2 \cdot x - x^2) + 2 \cdot (2 \cdot x - x^2)^2$$

converts to the series

$$2 \cdot x + 7 \cdot x^2 - 8 \cdot x^3 + 2 \cdot x^4$$

section 11

$$\tan(2 \cdot x)$$

converts to the series

$$2 \cdot x + \frac{8}{3} \cdot x^3 + \frac{64}{15} \cdot x^5 + O(x^6)$$

section 12

$$\lim_{x \rightarrow \infty} \left(\sqrt[3]{x^3 + 7 \cdot x^2} - \sqrt[3]{x^3 + 3 \cdot x^2} \right) \rightarrow \frac{4}{3}$$

section 13

$$\lim_{x \rightarrow 0} \frac{\operatorname{asin}(3 \cdot x) - 3 \cdot \operatorname{asin}(x)}{\tan(2 \cdot x) - 2 \cdot \tan(x)} \rightarrow 2$$

$$\lim_{x \rightarrow 0} \frac{\sin(3 \cdot x) - 3 \cdot \sin(x)}{\operatorname{atan}(2 \cdot x) - 2 \cdot \operatorname{atan}(x)} \rightarrow 2$$