1) $$\lim_{x \to \pi/4} \frac{\sin x - \cos x}{\cos(2x)}$$

2) $$\lim_{x \to 0} \frac{x}{\sqrt{1+3x} - 1}$$ (2 Arten)

3) $$\lim_{x \to 1} \frac{x^3 - 6x^2 + 9x - 4}{3 - 5x + x^2 + x^3}$$ (2 Arten)

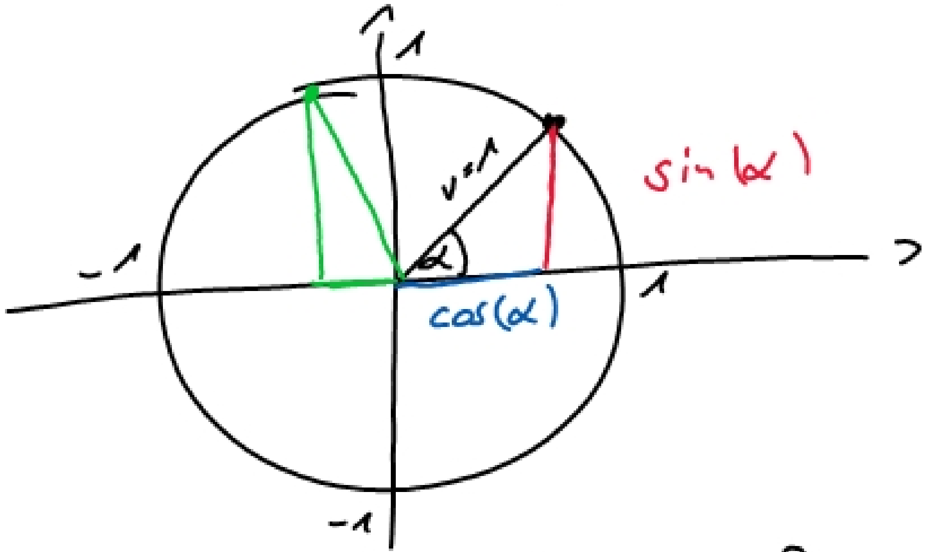
4) $$f(x) = \frac{x^3 - 2x^2 - x + 2}{3x^3 + 3x^2 - 3x - 3}$$

-> Faktorisierung

-> $\mathbb{D}$ / Ersatzfunktion

-> Interessante Grenzwerte

Trigonometrie



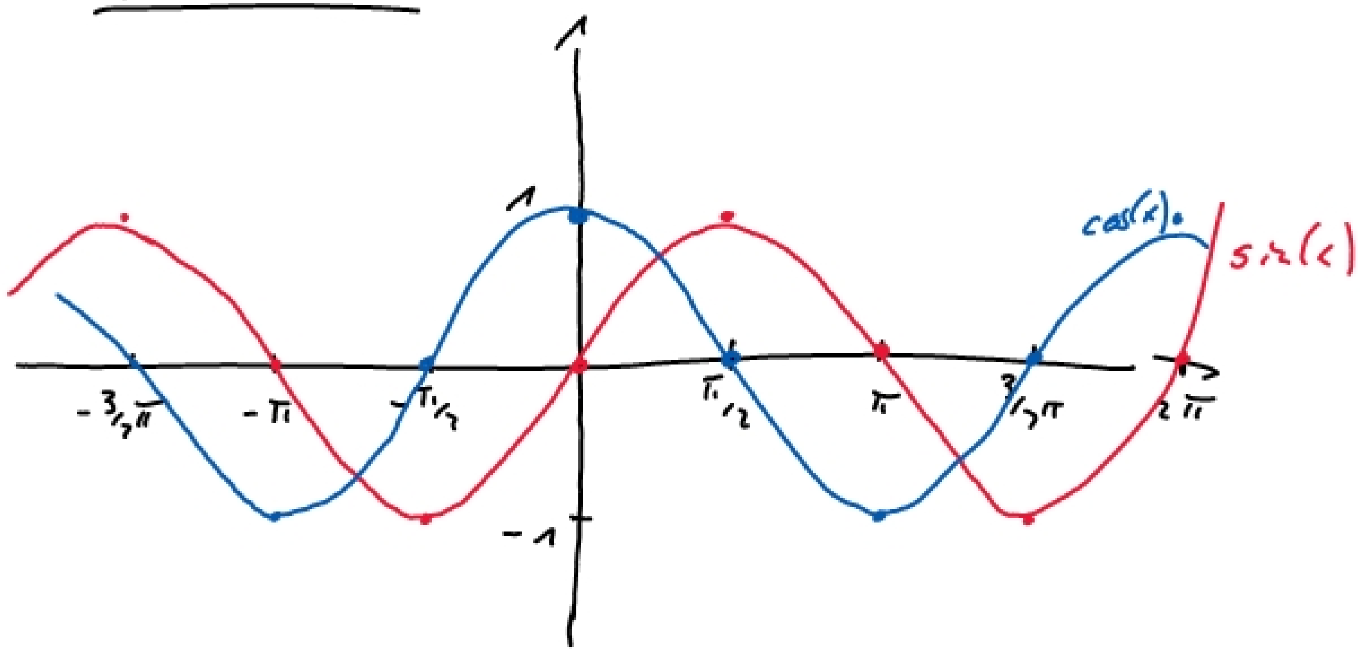
$$\lim_{x \to \pi/4} \frac{\sin(x) - \cos(x)}{\cos(2x)} = \left[\frac{0}{\cos(\pi/2)}\right] = \left[\frac{0}{0}\right]$$

$$\lim_{x \to \pi/4} \frac{\cos(x) - (-\sin(x))}{-\sin(2x) \cdot 2} = \frac{\cos(\pi/4) + \sin(\pi/4)}{-2 \cdot \sin(\pi/2)}$$

$$\rightarrow \frac{\sin(\pi/4) + \sin(\pi/4)}{-2 \cdot \sin(\pi/2)} = \frac{2 \cdot \sin(\pi/4)}{-2} = -\sin(\pi/4)$$

$$-1/\sqrt{2}$$

Funktion



2) $\lim\limits_{x \to 0} \frac{x}{\sqrt{1+3x}-1} = 0/0$

<u>L'Hospital :</u> $\left(\sqrt{1+3x}\right)' = \left[(1+3x)^{1/2}\right]' = 1/2 \cdot (1+3x)^{-1/2} \cdot 3$

$$\downarrow$$

$$\frac{3}{2\sqrt{1+3x}}$$

$$\lim_{x \to 0} \frac{1}{\frac{3}{2 \cdot \sqrt{1+3x}}} = \frac{1}{\frac{3}{2}} = 2/3$$

<u>3. Binom</u>

$$\frac{x}{\underset{a}{\sqrt{1+3x}} \underset{-b}{-1}} \cdot \frac{\sqrt{1+3x}+1}{\underset{a}{\sqrt{1+3x}} \underset{+b}{+1}} = \frac{x \cdot \left(\sqrt{1+3x}+1\right)}{\underbrace{1+3x}_{a^2} \underset{b^2}{-1}}$$

$$\frac{\sqrt{1+3x}+1}{3} = 2/3$$

3) $\lim\limits_{x \to 1} \dfrac{x^3 - 6x^2 + 9x - 4}{3 - 5x + x^2 + x^3} = 0/0$

<u>L'Hospital</u>: $\lim\limits_{x \to 1} \dfrac{3x^2 - 12x + 9}{-5 + 2x + 3x^2} = 0/0$

$\lim\limits_{x \to 1} \dfrac{6x - 12}{2 + 6x} = -6/8 = -3/4$

$(x^3 - 6x^2 + 9x - 4) : (x - 1) = x^2 - 5x + 4$
$-(x^3 - x^2)$
$-5x^2 + 9x - 4$
$-(-5x^2 + 5x)$
$4x - 4$
$-(4x - 4)$

vieta

$(x - 1)(x - 4)$

$(x - 1)(x - 1)(x + 3)$