

$$\int_1^z (3x^2 - 3) dx = F(z) - F(1) = 4$$

$(z+1)(z+1)(z-2)$

$$F(x) = x^3 - 3x \Rightarrow z^3 - 3z - (1^3 - 3 \cdot 1) = 4$$

$$z^3 - 3z - 2 = 0 \quad z = 2$$

$\text{Oz}$

$$\begin{array}{r} (z^3 - 3z - 2) : (z - 2) \\ \hline - (z^3 - 2z^2) \\ \hline - 2z^2 - 3z - 2 \\ - (2z^2 - 4z) \\ \hline z - 2 \\ - (z - 2) \\ \hline \end{array}$$

$$(z^2 + 2z + 1)$$

$$(z + 1)^2$$

$\left\{ z = -1; 2 \right\}$

$$2) \quad a) \quad h(x) = 3 - 2 \cdot \underbrace{\sin(5-4x)}_{\text{Ausgleichsfaktor} \cdot \text{Tastfunktion}}$$

$H(x) = \dots$  Ausgleichsfaktor  $\cdot$  Tastfunktion

$$4 \cdot r = -2 \\ r = -\frac{1}{2}$$

$$\bar{t}(x) = \cos(5-4x) \\ \bar{t}'(x) = \underline{-4 \cdot (-1)} \cdot \sin(5-4x)$$

$$H(x) = 3 + -\frac{1}{2} \cos(5-4x)$$

$$5) \quad k(x) = \sqrt[3]{12 - \frac{1}{2}x} : (12 - \frac{1}{2}x)^{\frac{1}{3}}$$

$$-\frac{2}{3} \cdot x = 1$$

$$\bar{t}(x) = \dots \cdot (12 - \frac{1}{2}x)^{\frac{1}{3}}$$

$$x = -\frac{3}{2}$$

$$\bar{t}'(x) = \frac{4}{3} \cdot (12 - \frac{1}{2}x)^{\frac{1}{3}} \cdot (-\frac{1}{2})$$

$$k'(x) = -\frac{4}{3} \cdot \sqrt[3]{(12 - \frac{1}{2}x)^4}$$

$$= -\frac{4}{3} \cdot \sqrt[3]{12 - \frac{1}{2}x}$$

$$3) \text{ a) } f(x) = g(x) \quad \text{d.h. } f(x) \cdot g(x) = 0$$

$$x^3 - 5x + 4 = (x-4)(x+1) = 0$$

$$\int_1^4 (x^3 - 5x + 4) dx = F(4) - F(1)$$

$$F(x) = \frac{1}{4}x^4 - \frac{5}{2}x^2 + 4x$$

$$F(4) = \frac{64}{3} - 40 + 16 = \frac{128 - 240 + 96}{6} = -\frac{16}{6} = \frac{8}{3}$$

$$F(1) = \frac{1}{4} - \frac{5}{2} + 4 = \frac{2 - 15 + 16}{6} = \frac{11}{6}$$

$$\Rightarrow \frac{27}{6} = \frac{9}{2} = 4,5 \text{ r.E}$$

$$5) \quad f(x) = x^3 - x^1 \quad g(x) = x^2 + x - 2$$

$$d(x) = x^3 - 2x^2 - x + 2 = 0 \\ (x-1)(x-2)(x+1)$$

$$\int_{-1}^1 d(x) dx - \int_1^2 d(x) dx$$

$$D(x) = \frac{1}{4}x^4 - \frac{2}{3}x^3 - \frac{1}{2}x^2 + 2x \\ = \frac{1}{12}(3x^4 - 8x^3 - 6x^2 + 24x)$$

$$D(-1) = \frac{1}{12} \cdot (3 + 8 - 6 - 24) = \frac{1}{12} \cdot (-19)$$

$$D(1) = \frac{1}{12} (3 - 8 - 6 + 24) = \frac{1}{12} \cdot 13$$

$$D(2) = \frac{1}{12} (48 - 64 - 24 + 48) = \frac{1}{12} \cdot 8$$

$$\left| \frac{13}{12} + \frac{19}{12} \right| + \left| \frac{8}{12} - \frac{13}{12} \right| = \frac{32}{12} + \frac{5}{12} = \frac{37}{12}$$

$$1) a) \int_1^{\infty} \left(\frac{2}{x^5}\right) dx \Rightarrow \text{Peripherie} \cdot \lim_{x \rightarrow \infty} \left(\frac{2}{x^5}\right) = 0 \quad \checkmark$$

$$\bar{f}(x) = -\frac{2}{5} x^{-4} = -\frac{1}{2x^4}$$

$$\bar{f}(\infty) = \lim_{x \rightarrow \infty} \left(-\frac{1}{2x^4}\right) = \left[-\frac{1}{2 \cdot \infty^4}\right] = 0^-$$

$$\bar{f}(1) = -1/2$$

$$\bar{f}(\infty) - \bar{f}(1) = 0^- - (-1/2) = 1/2 \quad \text{rc=}$$

$$b) \int_0^1 \left( \frac{2}{x} \right) dx = 2 \cdot \int_0^1 \left( \frac{1}{x} \right) dx = \tilde{r}(1) - \tilde{r}(0)$$

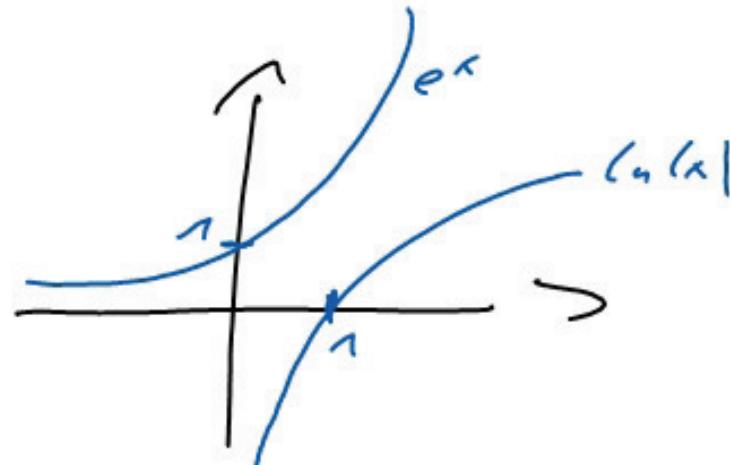
$\tilde{r}(x) = C_n x$  ,  $D = IR^{>0}$

—————  
↑

$$\tilde{r}(1) = C_n(1) = 0$$

$$F(0) = \lim_{x \rightarrow 0^-} C_n(x) = -\infty$$

$$F(1) - \tilde{r}(0) = 0 - (-\infty) = \infty$$



$$2) \int_{r}^{\infty} \left( \frac{1}{(2x-2)^2} \right) dx = \frac{1}{16}$$

$$\hookrightarrow (2x-2)^{-2} \Rightarrow F(x) = -\frac{1}{2}(2x-2)^{-1}$$

$$F(x) = -\frac{1}{(2x-2) \cdot 2} = -\frac{1}{4x-4}$$

$$F(\infty) = \lim_{x \rightarrow \infty} \left( -\frac{1}{(2x-2) \cdot 2} \right) \cdot \left[ \frac{-1}{\infty} \right] = 0$$

$$F(r) = -\frac{1}{4r-4}$$

$$F(\infty) - F(r) = 0 + \frac{1}{4r-4} = \frac{1}{16} \quad r = 5$$

$$2 \cdot \int 2x^2 \cdot \cos(1-x) dx$$

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$$\begin{aligned} f'(x) &= \cos(1-x) & f(x) &= -\sin(1-x) \\ g(x) &= x^2 & g'(x) &= 2x \end{aligned}$$

$$\begin{aligned} &-x^2 \cdot \sin(1-x) - \int -\sin(1-x) \cdot 2x dx \\ &-x^2 \cdot \sin(1-x) + 2 \cdot \int x \cdot \sin(1-x) dx \end{aligned}$$

$$\begin{aligned} f'(x) &= \sin(1-x) & f(x) &= \cos(1-x) \\ g(x) &= x & g'(x) &= 1 \end{aligned}$$

$$x \cdot \cos(1-x) - \int 1 \cdot \cos(1-x) dx$$

$$2 \cdot \left[ -x^2 \cdot \sin(1-x) + 2x \cdot \cos(1-x) + 2 \cdot \sin(1-x) \right] + C$$

$$\int [e^{-x} \cdot \cos(2x)] dx$$

$$f'(x) = e^{-x}$$

$$f(x) = -e^{-x}$$

$$g(x) = \cos(2x)$$

$$g'(x) = -2 \cdot \sin(2x)$$

$$-e^{-x} \cdot \cos(2x) - 2 \cdot \underline{\int e^{-x} \cdot \sin(2x) dx}$$

$$f'(x) = e^{-x}$$

$$f(x) = -e^{-x}$$

$$g(x) = \sin(2x)$$

$$g'(x) = 2 \cdot \cos(2x)$$

$$-e^{-x} \cdot \sin(2x) + 2 \cdot \int e^{-x} \cos(2x) dx$$

$$\begin{aligned}
 & \underbrace{\int e^{-x} \cdot \cos(2x) dx}_{\text{I}} \\
 & -e^{-x} \cdot \cos(2x) - 2 \cdot \int e^{-x} \cdot \sin(2x) dx \\
 & -e^{-x} \cos(2x) - 2 \cdot \left[ -e^{-x} \sin(2x) + 2 \cdot \int e^{-x} \cos(2x) dx \right] \\
 \Rightarrow & -e^{-x} \cos(2x) + 2 \cdot e^{-x} \sin(2x) - 4 \cdot \underbrace{\int e^{-x} \cos(2x) dx}_{\text{I}} \\
 & 5 \cdot \int e^{-x} \cos(2x) dx = -e^{-x} \cdot \cos(2x) + 2 \cdot e^{-x} \cdot \sin(2x) + 1 \cdot \text{I}_1
 \end{aligned}$$

$$\int e^{-x} \cdot \cos(2x) dx = \frac{1}{5} e^{-x} \cdot (2 \sin(2x) - \cos(2x))$$

$$3) \text{ L) } \int_0^2 \frac{x^2}{\sqrt{1+x^3}} dx$$

$$u = 1+x^3 \quad dx = \frac{du}{3x^2} \quad \int_0^2 \dots dx = \int_0^{13} \dots du$$

$$\int_0^{12} \frac{x^2}{\sqrt{u}} \cdot \frac{du}{3x^2} = \frac{1}{3} \int_0^{13} \frac{1}{\sqrt{u}} du = [F(12) - F(0)] \Big|_{13}$$

$$F(u) = 2\sqrt{u}$$

$$\Rightarrow \frac{1}{3} \cdot [2\sqrt{12} - 2\sqrt{0}] = \frac{2}{3}\sqrt{12} = \sqrt{\frac{16}{3}} = 4 \cdot \sqrt{\frac{1}{3}}$$

$$\overbrace{\frac{4}{\sqrt{3}}} \approx \frac{4}{1.7} \approx 2$$