

# Übung 1 Angelo Brade

Donnerstag, 13. Oktober 2022 10:28

①

(i) Erd-Umfang:  $s \approx 40.000 \text{ km}$

Laufen:  $v \approx 1 \text{ m/s}$

$$t = \frac{s}{v}$$

$$t = \frac{40.000 \text{ km}}{1 \text{ m/s}}$$

$$t = 40 \cdot 10^6 \text{ s}$$

Fahren:  $v \approx 100 \text{ km/h}$

$$t = \frac{s}{v}$$

$$t = \frac{40.000 \text{ km}}{100 \text{ km/h}}$$

$$t = 400 \text{ h}$$

Fliegen:  $v = 800 \text{ km/h}$

$$t = \frac{s}{v}$$

$$t = \frac{40.000 \text{ km}}{800 \text{ km/h}}$$

$$t = 50 \text{ h}$$

(ii)  $d_s \approx 10^{-10} \text{ m}$

$$v_s \approx 10^{-3} \text{ m/s}$$

$$v_s \approx 10^3 d_s / \text{s}$$

(iii)  $h \approx 0,2 \text{ m}$

(iv)  $r = 6400 \text{ km}; h_{\text{meer}} = 2 \text{ km} \quad M(\text{H}_2\text{O}) = 18 \text{ g/mol}$

$$V = \frac{4}{3} \pi (r^3 - (r-h)^3) \quad \rho_{\text{H}_2\text{O}} \approx 1 \frac{\text{kg}}{\text{dm}^3}; 1 \text{ mol} \approx 6 \cdot 10^{23}$$

$$V = \frac{4}{3} \pi (6400^3 - 6398^3) \quad \rho_{\text{H}_2\text{O}} \approx 1$$

$$V \approx 1,03 \cdot 10^{18} \text{ m}^3 \Rightarrow m(\text{H}_2\text{O}) = 1,03 \cdot 10^{24} \text{ g}; n(\text{H}_2\text{O}) = \frac{m(\text{H}_2\text{O})}{M(\text{H}_2\text{O})} \approx 0,05770 \cdot 10^{24} = 3,42 \cdot 10^{26} \text{ Moleküle}$$

②

(i)  $f(x) = 5x^4, f'(x) = 20x^3$

$$f(x) = e^{ax}, f'(x) = ae^{ax}$$

$$f(x) = x^{-1}, f'(x) = -1x^{-2}$$

$$f(x) = \sin(\omega x); f'(x) = \omega \cos(\omega x)$$

(ii)  $g(a) = a^2 x^2; g'(a) = 2ax^2$

(iii)  $f(x) = 5x^4; \int f(x) = x^5 + c$

$$f(x) = e^{ax}; \int f(x) = \frac{1}{a} e^{ax} + c$$

$$f(x) = x^{-1}; \int f(x) = \ln(|x|) + c$$

$$f(x) = c; \int f(x) = ax + c$$

$$f(x) = x^{-1}; \int f(x) = \ln(|x|) + c$$

$$f(x) = \sin(\omega x); \int f(x) = -\frac{1}{\omega} \cos(\omega x) + c$$

$$(iv) f(x) = 5x^4; f''(x) = 60x^2; 60x^2 + 5x^4 = 0 \Rightarrow x = 0$$

$$f(x) = e^{ax}; f''(x) = a^2 e^{ax}; a^2 e^{ax} + e^{ax} = 0 \Rightarrow a = \sqrt{-1} \text{ in } \mathbb{C}; \text{ keine Lösung in } \mathbb{R}$$

$$f(x) = x^{-1}; f''(x) = 2x^{-3}; 2x^{-3} + x^{-1} \neq 0 \Rightarrow \text{keine Lösung}$$

$$f(x) = \sin(\omega x); f''(x) = -\omega^2 \sin(\omega x); -\omega^2 \sin(\omega x) + \sin(\omega x) = 0 \Rightarrow \omega = \pm 1$$