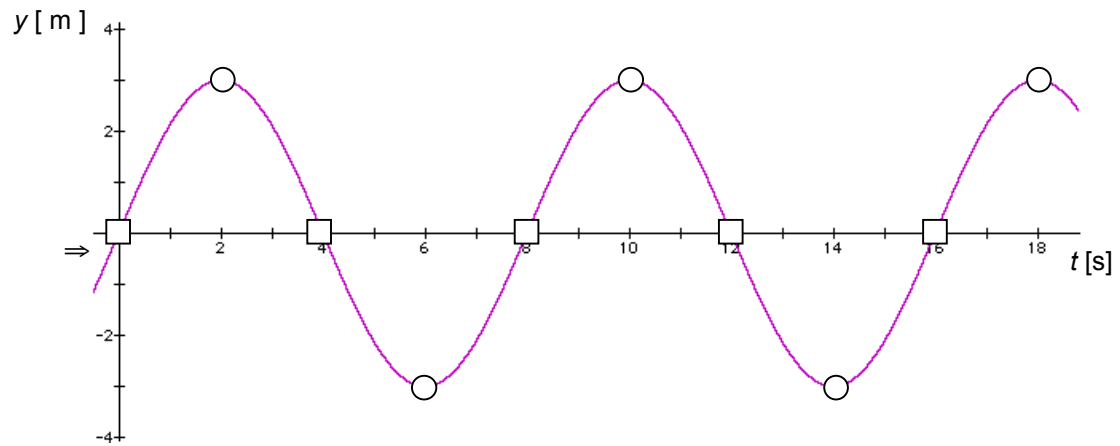


1. a) kleiner b) kleiner

2. a) Ruhelagen: ☐ Umkehrpunkte: ☐



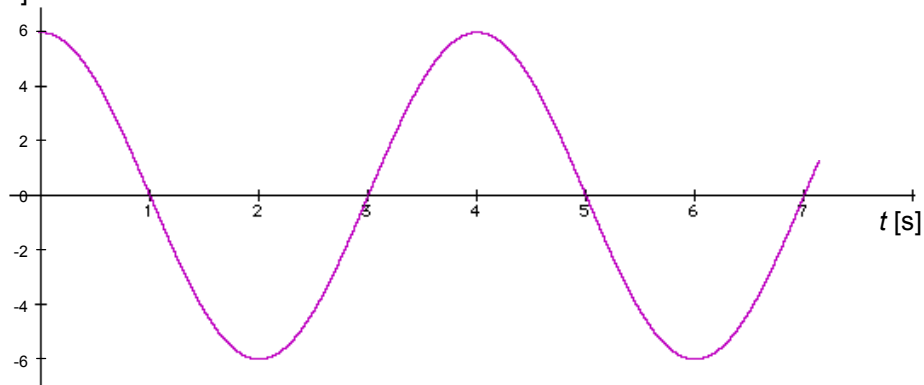
b) $\hat{y} = 3.0 \text{ m}$, $T = 8.0 \text{ s}$, $f = \frac{1}{T} = \frac{1}{8.0 \text{ s}} = 0.125 \text{ Hz}$,

$\omega = 2 \cdot \pi \cdot f = 2 \cdot \pi \cdot 0.125 \text{ Hz} = 0.785 \text{ s}^{-1}$

c) -2.0 m

d) 1.0 s , 3.0 s , 9.0 s , 11 s , 17 s , 19 s , etc.

3. $y \text{ [cm]}$



a) 0 , -6.0 cm , 0

b) 3 mal

c) 2 mal

d) 2.5

e) $T = 4.0 \text{ s}$, $f = \frac{1}{T} = \frac{1}{4 \text{ s}} = 0.25 \text{ Hz}$

f) $\omega = 2 \cdot \pi \cdot f = 2 \cdot \pi \cdot 0.25 \text{ Hz} = 1.57 \text{ s}^{-1}$

g) $\frac{\pi}{2}$

$$4. \quad a) \quad f = \frac{1}{T} = \frac{1}{3.60 \text{ s}} = \underline{\underline{0.278 \text{ Hz}}}$$

$$b) \quad \omega = 2 \cdot \pi \cdot f = 2 \cdot \pi \cdot 0.278 \text{ Hz} = \underline{\underline{1.75 \text{ s}^{-1}}}$$

$$c) \quad y(t_1) = \hat{y} \cdot \sin(\omega \cdot t_1) = 4.30 \text{ cm} \cdot \sin(1.75 \text{ s}^{-1} \cdot 0.900 \text{ s}) = \underline{\underline{4.30 \text{ cm}}}$$

$$y(t_2) = \underline{0} \quad y(t_3) = \underline{\underline{2.15 \text{ cm}}} \quad y(t_4) = \underline{\underline{-4.30 \text{ cm}}}$$

$$5. \quad a) \quad T = \frac{1}{f} = \frac{1}{0.40 \text{ Hz}} = \underline{\underline{2.5 \text{ s}}}$$

$$b) \quad \omega = 2 \cdot \pi \cdot f = 2 \cdot \pi \cdot 0.40 \text{ Hz} = \underline{\underline{2.5 \text{ s}^{-1}}}$$

$$c) \quad y(t_1) = \hat{y} \cdot \sin(\omega \cdot t_1 + \varphi_0) = 1.7 \text{ cm} \cdot \sin\left(2.5 \text{ s}^{-1} \cdot 1.2 \text{ s} + \frac{\pi}{4}\right) = \underline{\underline{-1.0 \text{ cm}}}$$

$$y(t_2) = \underline{\underline{1.2 \text{ cm}}}$$

$$6. \quad \hat{y} = \frac{y(t)}{\sin(\omega \cdot t)} = \frac{8.00 \text{ cm}}{\sin(2 \cdot \pi \cdot 0.160 \text{ Hz} \cdot 0.500 \text{ s})} = \underline{\underline{16.6 \text{ cm}}}$$

$$7. \quad a) \quad \sin(\omega \cdot t) = \frac{y(t)}{\hat{y}} \quad \Rightarrow \quad \omega \cdot t = \arcsin\left(\frac{y(t)}{\hat{y}}\right) = \arcsin\left(\frac{4.0 \text{ cm}}{10.0 \text{ cm}}\right) = 0.41$$

$$f = \frac{\arcsin\left(\frac{y(t)}{\hat{y}}\right)}{2 \cdot \pi \cdot t} = \frac{0.41}{2 \cdot \pi \cdot 0.0050 \text{ s}} = \underline{\underline{13 \text{ Hz}}}$$

$$b) \quad T = \frac{1}{f} = \frac{1}{13 \text{ Hz}} = \underline{\underline{0.076 \text{ s}}}$$

$$8. \quad \sin(\omega \cdot t) = \frac{y(t)}{\hat{y}} \quad \Rightarrow \quad \omega \cdot t = \arcsin\left(\frac{y(t)}{\hat{y}}\right) = \arcsin\left(\frac{8.0 \text{ cm}}{10.0 \text{ cm}}\right) = 0.93$$

$$t = \frac{\arcsin\left(\frac{y(t)}{\hat{y}}\right)}{2 \cdot \pi \cdot f} = \frac{0.93}{2 \cdot \pi \cdot 2.0 \text{ Hz}} = \underline{\underline{0.074 \text{ s}}}$$

9. a) Zu den Zeiten $t = 0, 8.0 \text{ s}, 16 \text{ s}, 24 \text{ s}, \text{ etc.}$

(jeweils nach $0, \frac{1}{2}, \frac{2}{2}, \frac{3}{2}$ etc. einer Periode)

$$\text{b) } v(t) = \hat{y} \cdot \omega \cdot \cos(\omega \cdot t) = 0.15 \text{ m} \cdot 0.39 \text{ s}^{-1} \cdot \cos(0.39 \text{ s}^{-1} \cdot 0) = \underline{\underline{0.059 \frac{\text{m}}{\text{s}}}}$$

Hinweis: $\cos(0) = 1$

$$\text{c) } a(t) = -\hat{y} \cdot \omega^2 \cdot \sin(\omega \cdot t) = -0.15 \text{ m} \cdot (0.39 \text{ s}^{-1})^2 \cdot \sin(0.39 \text{ s}^{-1} \cdot 0) = \underline{\underline{0}}$$

Hinweis: $\sin(0) = 0$

- d) Zu den Zeiten $t = 4.0 \text{ s}, 12 \text{ s}, 20 \text{ s}, 28 \text{ s}, \text{ etc.}$

(jeweils nach $\frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4}$ etc einer Periode)

$$\text{e) } v(t) = \hat{y} \cdot \omega \cdot \cos(\omega \cdot t) = 0.15 \text{ m} \cdot 0.39 \text{ s}^{-1} \cdot \cos\left(\frac{2 \cdot \pi}{16 \text{ s}} \cdot 4.0 \text{ s}\right) = \underline{\underline{0}}$$

Hinweis: $\cos\left(\frac{\pi}{2}\right) = 0$

$$\text{f) } a(t) = -\hat{y} \cdot \omega^2 \cdot \sin(\omega \cdot t) = -0.15 \text{ m} \cdot (0.39 \text{ s}^{-1})^2 \cdot \sin\left(\frac{2 \cdot \pi}{16 \text{ s}} \cdot 4.0 \text{ s}\right) = \underline{\underline{-0.023 \frac{\text{m}}{\text{s}^2}}}$$

Hinweis: $\sin\left(\frac{\pi}{2}\right) = 1$