

Física II - Lista 1A

1

a) $A_1 = x_0$ $A_2 = \frac{v_0}{\omega_0}$
b)

$$\begin{aligned}x(t) &= A \cos(\omega_0 t - \phi) \\&= A [\cos \omega_0 t \cos \phi + \sin \omega_0 t \sin \phi] \\&= A_1 \cos \omega_0 t + A_2 \sin \omega_0 t\end{aligned}$$

c) $A = \sqrt{x_0^2 + (\frac{v_0}{\omega_0})^2}$ $\phi = \arctan(\frac{v_0}{x_0 \omega_0})$

2

a) $x(t) = 0,1 \cos[7,07t]$ $v_{max} = 0,7 \text{ m/s}$ $E_M = 2,5 \cdot 10^{-3} \text{ N}$
b) $x(t) = 0,14 \cos[7,07t + \frac{\pi}{2}]$ $U_{max} = 0,05 \text{ N}$
c) $x(t) = 0,34 \cos[7,07t - 54,7]$ $E_M = 0,3 \text{ N}$

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a) $x(t) = 0,02 \cos[3\pi t] - \frac{\pi}{2}$
b) $v(t) = -0,06\pi \sin[3\pi t - \frac{\pi}{2}]$ $a(t) = -0,18\pi^2 \cos[3\pi t - \frac{\pi}{2}]$
 $v_{max} = -0,18 \text{ m/s}$ $a_{max} = -1,77 \text{ m/s}^2$

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$v_{max} = 67,85 \text{ km/h}$

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a) $f = 2,2 \text{ Hz}$ b) $v = 0,56 \text{ m/s}$ c) $m_1 = 0,1 \text{ kg}$ d) $y = 0,2 \text{ m}$

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$\beta = 6,93$ $\omega_1 = 7,2 \text{ rad/s}$

7

$$b = 0,002$$

8

$$\text{a) } t = 5,06 \text{ s} \quad \text{b) } t = 2,53 \text{ s} \quad \text{c) } \frac{2}{e(t)} \frac{dE(t)}{dt} = \frac{1}{A(t)} \frac{dA(t)}{dt}$$

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$$A_0 = x_0 \quad B_0 = v_0 + \beta x_0$$

10

$$\begin{array}{ll} \text{a) } x(t) = e^{-10t}(-t - 0,2) & v(t) = e^{-10t}(10t + 1) \\ \text{b) } x(t) = e^{-10t}t & v(t) = e^{-10t}(1 - 10t) \\ \text{c) } x(t) = e^{-10t}(3t + 0,2) & v(t) = e^{-10t}(1 - 30t) \\ \text{d) } x(t) = e^{-10t}(0,4 + 2t) & v(t) = e^{-10t}(-2 - 20t) \\ \text{e) } x(t) = e^{-10t}(0,4 + 4t) & v(t) = e^{-10t}(-40t) \\ \text{f) } x(t) = e^{-10t}(0,4 + 6t) & v(t) = e^{-10t}(2 - 60t) \end{array}$$

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$$A = \frac{x_0(\omega_2 + \beta) + v_0}{2\omega_2} \quad B = \frac{x_0(\omega_2 - \beta) - v_0}{2\omega_2}$$

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$$\begin{array}{ll} \text{a) } x(t) = e^{-20t}[-0,19e^{-2,68t} - 0,013e^{-17,3t}] & v(t) = 0,5e^{-2,68t} - 0,48e^{-37,32t} \\ \text{b) } x(t) = e^{-20t}[0,029e^{-2,68t} - 0,029e^{-17,3t}] & v(t) = -0,07e^{-2,68t} + 1,08e^{-37,32t} \\ \text{c) } x(t) = e^{-20t}[0,24e^{-2,68t} - 0,044e^{-17,3t}] & v(t) = -0,64e^{-2,68t} + 1,64e^{-37,32t} \\ \text{d) } x(t) = e^{-20t}[0,37e^{-2,68t} - 0,027e^{-17,3t}] & v(t) = -0,99e^{-2,68t} - e^{-37,32t} \\ \text{e) } x(t) = e^{-20t}[0,43e^{-2,68t} - 0,031e^{-17,3t}] & v(t) = -1,15e^{-2,68t} + 1,15e^{-37,32t} \\ \text{f) } x(t) = e^{-20t}[0,49e^{-2,68t} - 0,089e^{-17,3t}] & v(t) = -1,31e^{-2,68t} + 3,32e^{-37,32t} \end{array}$$

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$$x(t) = 0,86\cos(\omega_0 t) + 1,5\sin(\omega_0 t)$$

14

$$\text{a) } D_{max} = \frac{F_0/m}{2\beta\omega_0} \quad \text{b) } v_{max} = \frac{iF_0}{2m} \frac{1}{\sqrt{\omega_0^2 - \beta^2}}$$

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$$\text{a) } \omega_0 = 20 \quad \text{b) } D = 0,5 \text{ m} \quad \text{c) } \omega_{max} = 15,4 \text{ rad/s}$$