

Elementary Engineering Mathematics

Exercises #9 Answers

1. a) $x(t) = 1.875e^{-6t} \sin(8t)$ (ft) and $v(t) = \dot{x}(t) \approx 18.75e^{-6t} \sin(8t + 2.214)$ (ft/s)
b) $a(t) = \dot{v}(t) \approx 187.5e^{-6t} \sin(8t + 4.429)$ (ft/s²)
c) $a(0) \approx -180$ (ft/s²)
d) displacement has local max/min when $\dot{x}(t) = 0$. This first occurs at $t \approx 0.116$ (sec).
2. a) $V(x) = 375 - 100x$ (lb) for $(0 \leq x \leq 5)$
 $V(x) = -125$ (lb) for $(5 \leq x \leq 10)$
b) $\hat{x} = 3.75$ (ft) and $M_{\max} \approx 703$ (ft-lb)
3. a) $v(t) = 0.125t^2(3 - 2t)e^{-2t}$
b) $v(t) = 0$ when $t = 0, \frac{3}{2}, \infty$
 $i(0) = 0$ and $i|_{t=1.5} \approx 0.168$ (amps)
c) See plot below.
4. $i(t) \approx -e^{-30t} [0.00792 \cos(120\pi t) + 0.0995 \sin(120\pi t)]$
 $\approx -0.0998e^{-30t} \cos(120\pi t - 1.49)$ (amps)

