Use the expression
\[ T = 2 \int_{x_{\text{min}}}^{x_{\text{max}}} \frac{dx}{\sqrt{2(E - V(x))/m}} \]
to calculate the dependence on the amplitude \( x_{\text{max}} \) of the period \( T \) for the motion of a particle with mass \( m \) moving
(a) in the quadratic potential \( V_2(x) = \frac{1}{2} m \omega_0^2 x^2 \),
(b) in the quartic potential \( V_4(x) = \frac{1}{4} \alpha x^4 \).

Solution: