$$
\begin{aligned}
a_1 &= 0.5k, \\
b_1 &= -\mu_k mg\cos(\theta) - mg\sin(\theta), \\
c_1 &= -0.5kx_0^2 + x_0 mg\sin(\theta) + x_0\mu_k mg\cos(\theta) \\
a_2 &= 0.5k \\
b_2 &= \mu_k mg\cos(\theta) - mg\sin(\theta), \\
c_2 &= -0.5kx_0^2 + x_0 mg\sin(\theta) - x_0\mu_k mg\cos(\theta)
\end{aligned}
$$

$$
X_{new}(x_0) = \begin{cases} x_0 & \frac{mg\sin(\theta)-\mu_s mg\cos(\theta)}{k} \leq x_0 \leq \frac{mg\sin(\theta)+\mu_s mg\cos(\theta)}{k} \\ \frac{-b_1+\sqrt{b_1^2-4a_1c_1}}{2a_1} & x < \frac{mg\sin(\theta)+\mu_s mg\cos(\theta)}{k} \\ \frac{-b_2-\sqrt{(b_2^2-4a_2c_2)}}{2a_2} & x > \frac{mg\sin(\theta)-\mu_s mg\cos(\theta)}{k} \end{cases}
$$