$$m\ddot{x} + kx = F_f = \begin{cases} \gamma & \frac{dx}{dt} < 0 \\ -\gamma & \frac{dx}{dt} > 0 \end{cases}$$

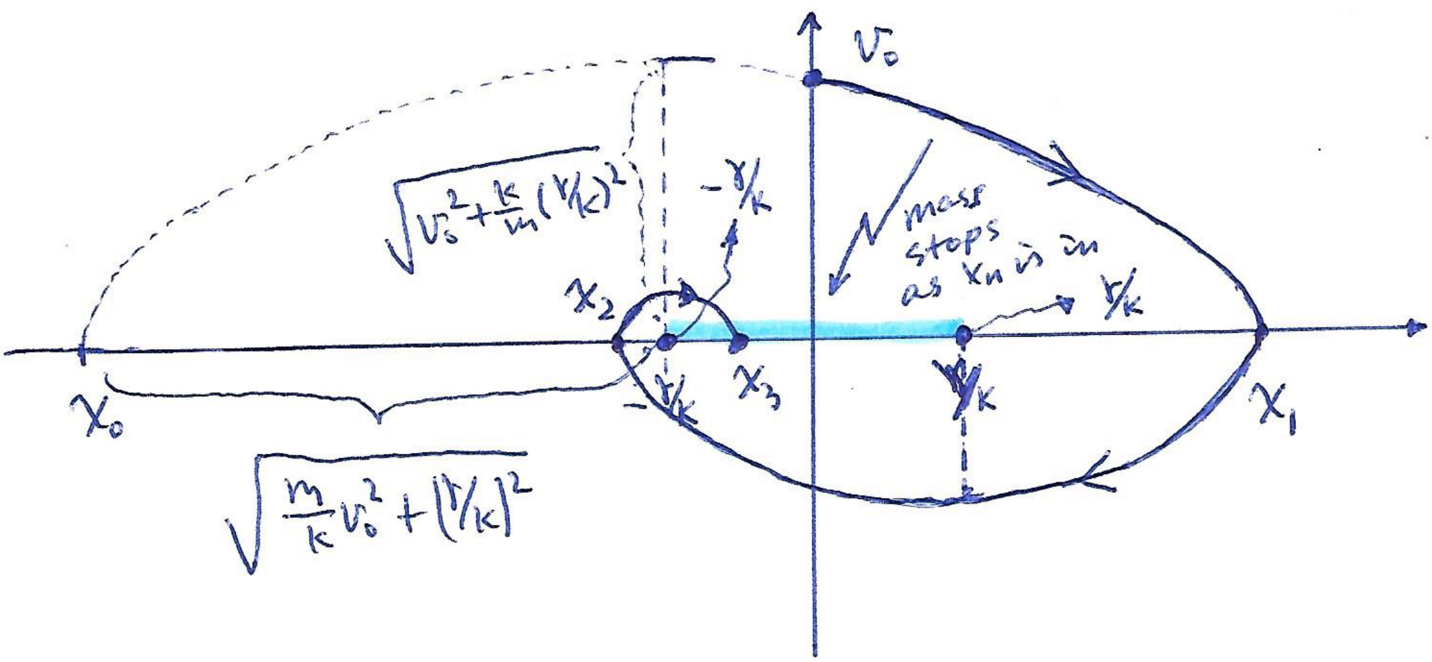
Consider $\frac{dx}{dt}(0) = v_0 > 0$.

$$m\ddot{x} + kx = -\gamma, \quad m\ddot{x} + k(x + \gamma/k) = 0$$

$$E^+(x, \dot{x}) = \frac{1}{2} m(\dot{x})^2 + \frac{1}{2} k(x + \gamma/k)^2$$

$$= \frac{1}{2} m v_0^2 + \frac{1}{2} k(\gamma/k)^2 = \frac{1}{2} k(x_0 + \gamma/k)^2$$

where $\overset{<0}{x_0}$ is as below



In case $dx/dt < 0$.

$$m\ddot{x} + kx = \gamma, \quad m\ddot{x} + k(x - \gamma/k) = 0$$

$$E^{-}(x, x') = \frac{1}{2}(\dot{x})^2 + \frac{1}{2}k(x - \gamma/k)^2$$
$$= \frac{1}{2}k(x_1 - \gamma/k)^2$$

where $x_1 > 0$ is as before on the figures

We have : $x_0 + x_1 = -2\gamma/k$

$$x_1 + x_2 = 2\gamma/k,$$
$$x_2 + x_3 = -2\gamma/k$$
$$x_3 + x_4 = 2\gamma/k$$
$$\vdots$$

stops as $|x_n| \leq \gamma/k$.

Notice $x_1 = -(2\gamma/k + x_0)$

$$x_2 = 4\gamma/k + x_0$$
$$x_3 = -(6\gamma/k + x_0)$$
$$x_4 = 8\gamma/k + x_0 \quad - - -$$

Now we have

$$|x_n| = \left|\frac{2n\gamma}{k} + x_0\right|$$

and $x_0 = -\gamma/k - \sqrt{\frac{m}{k}v_0^2 + (\gamma/k)^2} < -2\gamma/k$.

Criteria to stop:

$$|x_n| \leq \gamma/k.$$