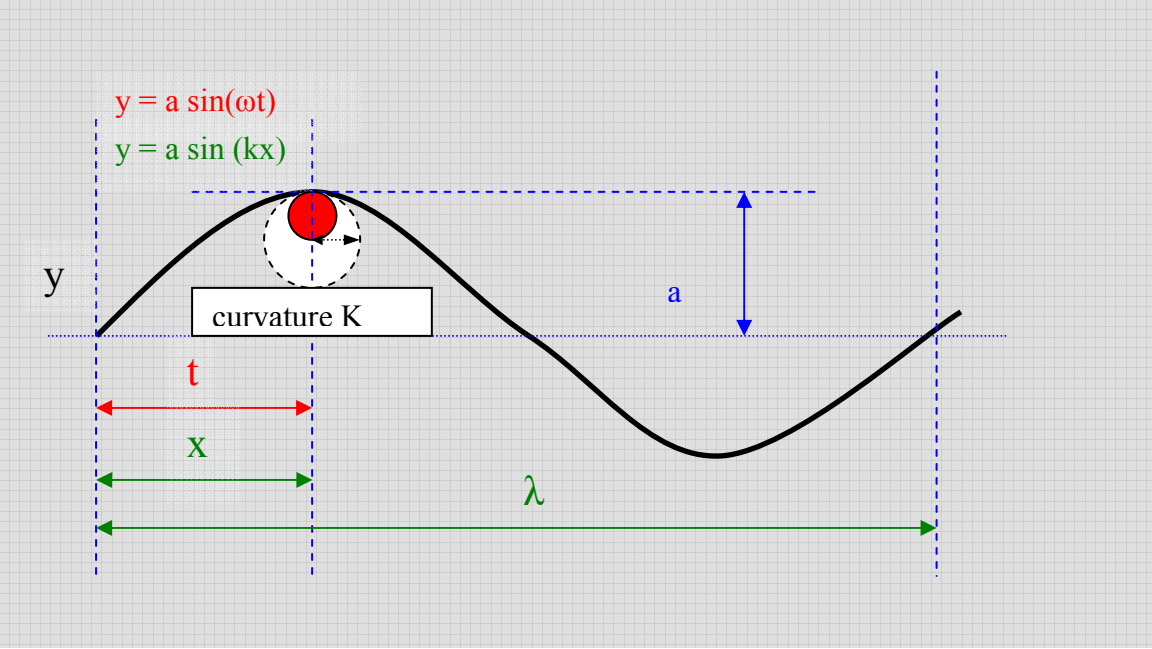
# Relationship between Peak Acceleration and Groove Curvature




Groove lateral position y [m] described in two systems, time and position :

$y = a \sin(\omega t)$ [m] ; where $\omega = 2\pi f$, f is frequency [Hz]
$y = a \sin(kx)$ [m] ; where $k = 2\pi/\lambda = 2\pi f/v$ is wavenumber [$m^{-1}$]

and where:

a is amplitude [m]
t is time [s]
x is distance along groove axis [m]
λ is wavelength [m]
and $\lambda = v/f$, where **v is linear velocity along groove axis due to rotation**

Peak curvature and peak acceleration have the same vector direction and occur at same y value, when $\omega t = kx = \pi/2, 3\pi/2, 5\pi/2 \ldots\ldots$ etc

Then peak groove curvature $K = ak^2$
and peak acceleration $\alpha = a\omega^2$ are equated since $K/k^2 = \alpha/\omega^2$, and

$$\mathbf{K = \alpha / v^2} \qquad [m^{-1}]$$

K is peak groove curvature [$m^{-1}$]
α is peak acceleration [$ms^{-2}$]
v is linear velocity along groove axis due to rotation [$ms^{-1}$]