Simple Harmonic Motion

The equation of simple harmonic motion (SHM) for a rise motion, as shown in Fig. 1, is:

$$s = \frac{h}{2}\left[1 - \cos\left(\pi\frac{\theta}{\beta}\right)\right]$$

The displacement s is the projection of a point on a circular arc to the s-axis (y-axis).

The velocity, acceleration and jerk equations are:

$$v = \frac{\pi}{\beta}\frac{h}{2}\sin\left(\pi\frac{\theta}{\beta}\right)$$

$$a = \frac{\pi^2}{\beta^2}\frac{h}{2}\cos\left(\pi\frac{\theta}{\beta}\right)$$

$$v = -\frac{\pi^3}{\beta^3}\frac{h}{2}\sin\left(\pi\frac{\theta}{\beta}\right)$$

where h is the total rise, or lift, θ is the camshaft angle, and β is the total angle of the rise interval. The s v a j diagrams are shown in Fig. 2.
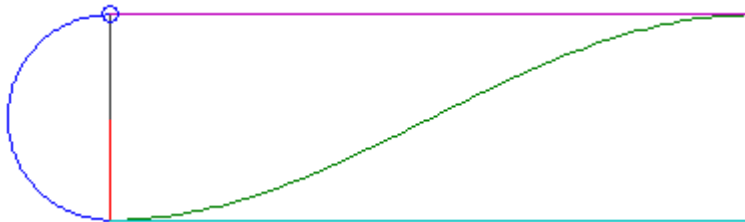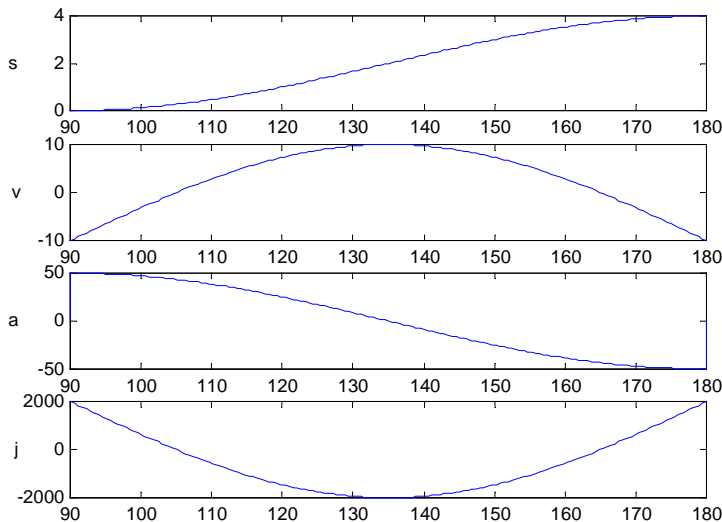

Figure 1
Matlab File

Figure 2