imaginary:

$$c\sin(\theta + \alpha) + \rho = R_b + s \tag{7.12c}$$

The center of curvature C is **stationary** on the cam, meaning that the magnitudes of c and ρ, and angle α do not change for small changes in cam angle θ. (These values are not constant but are at stationary values. Their first derivatives with respect to θ are zero, but their higher derivatives are not zero.)

Differentiating equation 7.12a with respect to θ then gives:

$$jce^{j(\theta+\alpha)} = \frac{dx}{d\theta} + j\frac{ds}{d\theta} \tag{7.13}$$

Substitute the Euler equation in equation 7.13 and separate the real and imaginary parts.

real:

$$-c\sin(\theta + \alpha) = \frac{dx}{d\theta} \tag{7.14}$$

imaginary:

$$c\cos(\theta + \alpha) = \frac{ds}{d\theta} = v \tag{7.15}$$

Inspection of equations 7.12b and 7.15 shows that:

$$x = v \tag{7.16}$$

This is an interesting relationship that says the x position of the contact point between cam and follower is numerically equal to the velocity of the follower in length/rad. This means that the v diagram gives a direct measure of the necessary minimum face width of the flat follower.

$$facewidth > v_{max} - v_{min} \tag{7.17}$$

If the velocity function is asymmetric, then a minimum-width follower will have to be asymmetric also, in order not to fall off the cam.

Differentiating equation 7.16 with respect to θ gives:

$$\frac{dx}{d\theta} = \frac{dv}{d\theta} = a \tag{7.18}$$

Equations 7.12c and 7.14 can be solved simultaneously and equation 7.18 substituted in the result to yield:

$$\rho = R_b + s + a \tag{7.19a}$$

and the minimum value of radius of curvature is

$$\rho_{min} = R_b + (s + a)_{min} \tag{7.19b}$$

Base Circle Note that equation 7.19 defines the radius of curvature in terms of the base circle radius and the displacement and acceleration functions from the $s\ v\ a\ j$ diagrams only. Because ρ cannot be allowed to become negative with a flat-faced fol-