Note that the first singularity term evaluates to 1 since $l^- > 0$ (see Eq. 3.17*c*, p. 117), the second singularity term evaluates to $(l - a)$ because $l^- > a$ in this problem (see Eq. 3.17*b*), and the third singularity term evaluates to 0 as defined in equation 3.17*c*. The maximum moment is found in similar fashion:

$$M_{\max} = M_{@x=5.8} = R_1\langle 5.8-0\rangle^1 - w\frac{\langle 5.8-a\rangle^2}{2} + R_2\langle 5.8-l\rangle^1$$

$$= R_1\langle 5.8\rangle^1 - w\frac{\langle 5.8-4\rangle^2}{2} + R_2\langle 5.8-10\rangle^1 \qquad (h)$$

$$= 18(5.8) - 10\frac{(5.8-4)^2}{2} + 0 = 88.2$$

The third singularity term evaluates to 0 because $5.8 < l$ (see Eq. 3.17*b*).

6 The results are

$$R_1 = 18 \qquad R_2 = 42 \qquad V_{max} = -42 \qquad M_{max} = 88.2 \qquad (i)$$

EXAMPLE 3-3A

Shear and Moment Diagrams of a Cantilever Beam Using a Graphical Method

Problem: **Determine and plot the shear and moment functions for the cantilever beam with a concentrated load as shown in Figure 3-22*b*.**

Given: **Beam length *l* = 10 in, and load location *a* = 4 in. The magnitude of the applied force is *F* = 40 lb.**

Assumptions: **The weight of the beam is negligible compared to the applied load and so can be ignored.**

Solution: **See Figures 3-22*b* and 3-25.**

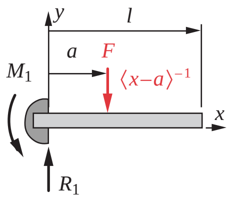
1 Solve for the reaction forces using equations 3.3 (p. 81). Summing moments about the left end and summing forces in the *y* direction gives

$$\sum M_z = 0 = Fa - M_1$$

$$M_1 = Fa = 40(4) = 160 \qquad (a)$$

$$\sum F_y = 0 = R_1 - F$$

$$R_1 = F = 40 \qquad (b)$$



Cantilever beam with concentrated loading

FIGURE 3-22b

Repeated