79. We assume the train accelerates from rest ($v_0 = 0$ and $x_0 = 0$) at $a_1 = +1.34 \text{ m/s}^2$ until the midway point and then decelerates at $a_2 = -1.34 \text{ m/s}^2$ until it comes to a stop ($v_2 = 0$) at the next station. The velocity at the midpoint is $v_1$ which occurs at $x_1 = 806/2 = 403$ m.

(a) Eq. 2-16 leads to

$$v_1^2 = v_0^2 + 2a_1x_1 \implies v_1 = \sqrt{2(1.34)(403)}$$

which yields $v_1 = 32.9$ m/s.

(b) The time $t_1$ for the accelerating stage is (using Eq. 2-15)

$$x_1 = v_0t_1 + \frac{1}{2}a_1t_1^2 \implies t_1 = \sqrt{\frac{2(403)}{1.34}}$$

which yields $t_1 = 24.53$ s. Since the time interval for the decelerating stage turns out to be the same, we double this result and obtain $t = 49.1$ s for the travel time between stations.

(c) With a "dead time" of 20 s, we have $T = t + 20 = 69.1$ s for the total time between start-ups. Thus, Eq. 2-2 gives

$$v_{\text{avg}} = \frac{806\,\text{m}}{69.1\,\text{s}} = 11.7 \text{ m/s} .$$

(d) We show the two of the graphs below. The third graph, $a(t)$, is not shown to save space; it consists of three horizontal "steps" – one at 1.34 during $0 < t < 24.53$ and the next at $-1.34$ during $24.53 < t < 49.1$ and the last at zero during the "dead time" $49.1 < t < 69.1$). SI units are understood.