# Problem 1.23

*Smooth elevator ride*
For a smooth ("low jerk") ride, an elevator is programmed to start from rest and accelerate according to

$$a(t) = (a_m/2)[1 - \cos(2\pi t/T)] \qquad 0 \le t \le T$$
$$a(t) = -(a_m/2)[1 - \cos(2\pi t/T)] \qquad T \le t \le 2T$$

where $a_m$ is the maximum acceleration and $2T$ is the total time for the trip.

(a) Draw sketches of $a(t)$ and the jerk as functions of time.

(b) What is the elevator's maximum speed?

(c) Find an approximate expression for the speed at short times near the start of the ride, $t \ll T$.

(d) What is the time required for a trip of distance $D$?

[TYPO: The right parenthesis is missing.]