28.2: Rate of Change of Power

As seen in the previous section, the powers (rates of change of kinetic and potential energy) of falling bodies change with time. But if the force is constant, then the rates of change of these powers (rate of change of rate of change of energy) is constant. Let's see why this is so: since the power $\mathcal{P}$ is given by

$$\mathcal{P} = Fv \tag{28.2.1}$$

the time rate of change of power is, if the force F is constant,

$$\frac{d\mathcal{P}}{dt} = F\frac{dv}{dt} = Fa \tag{28.2.2}$$

By Newton's second law, $F = ma$, so this gives

$$\frac{d\mathcal{P}}{dt} = ma^2 \quad (\text{ constant } a) \tag{28.2.3}$$

For the example of a body of mass m released from height h, this gives

$$\frac{d\mathcal{P}}{dt} = mg^2 \tag{28.2.4}$$