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$$a = g - cy = v \frac{dv}{dy}$$

$$\int_0^{y_m} (g - cy) dy = \int_{v_0}^0 v dv$$

$$\left(gy - c \frac{y^2}{2} \right) \Big|_0^{y_m} = \frac{v^2}{2} \Big|_{v_0}^0$$

$$gy_m - c \frac{y_m^2}{2} = -\frac{v_0^2}{2} \Rightarrow c = \frac{v_0^2 + 2gy_m}{y_m^2}$$