

### §3.4.5 落体の運動(粘性抵抗)

#### 問題 A

$$\text{II} \quad m \frac{dv}{dt} = mg - kv$$

$$\frac{dv}{dt} = g - \frac{k}{m}v = -\frac{k}{m}\left(v - \frac{mg}{k}\right) = -\alpha\left(v - \frac{mg}{k}\right) \quad \left(\alpha = \frac{k}{m} \text{ とおいた}\right)$$

$$\int \frac{dv}{v - \frac{mg}{k}} = -\alpha \int dt$$

$$\ln\left(v - \frac{mg}{k}\right) = -\alpha t + C$$

$$v - \frac{mg}{k} = K e^{-\alpha t}$$

$$v = \frac{mg}{k} + K e^{-\alpha t}$$

初期条件から

$$D = \frac{mg}{k} + K \quad \therefore K = -\frac{mg}{k}$$

(注),

$$v = \frac{mg}{k} (1 - e^{-\alpha t}) \longrightarrow \frac{mg}{k} (t \rightarrow \infty)$$