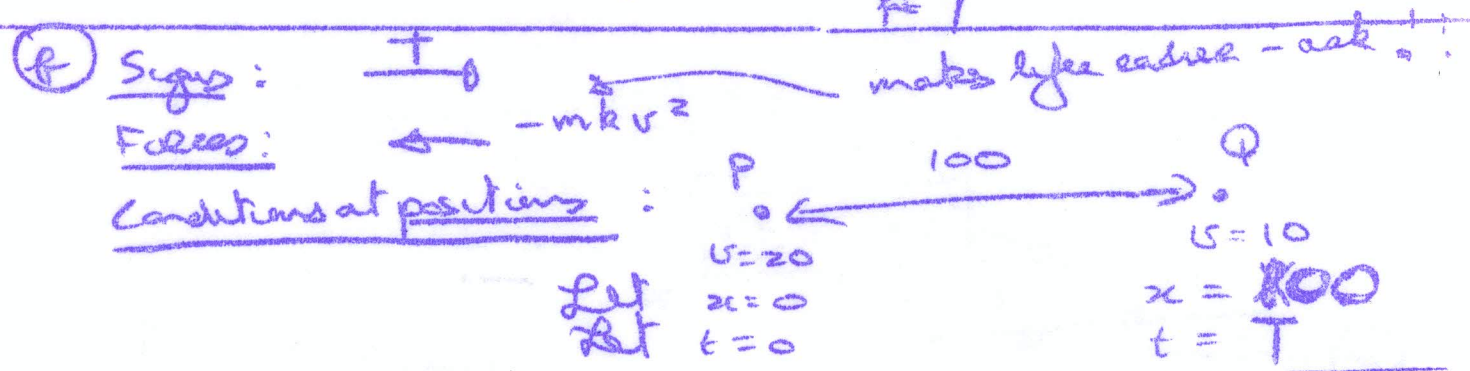


(a) $\frac{dv}{dt} = g - kv \Rightarrow \int \frac{dv}{g - kv} = \int dt + C$

Let $u = g - kv$
 $\frac{du}{dv} = -k$
 $-\frac{1}{k} du = dv$

$\Rightarrow \frac{1}{k} \ln(g - kv) = t + C$
 $\Rightarrow \ln(g - kv) = -kt - kC$
 $\Rightarrow \ln(g - kv) = -kt + D$ [Call $D \equiv -kC$]
 $\Rightarrow g - kv = e^{(-kt + D)}$
 $\Rightarrow -kv = -g e^{(-kt + D)}$
 $\Rightarrow v = \frac{1}{k} (g e^{(-kt + D)})$
 $\Rightarrow v = \frac{1}{k} [g - e^{(-kt + D)}]$
 As $t \rightarrow \infty$ $e^{-kt + D} \rightarrow 0$
 $\Rightarrow v \rightarrow \frac{g}{k}$ ged



NI: $\Rightarrow m(\text{accel}) = -mkv^2$
 $\Rightarrow \text{accel} = -kv^2$

Link v and t: \leftarrow Link v and x (Tafel 10)

$\frac{dv}{dt} = -kv^2$
 $\Rightarrow \int_{20}^{10} \frac{-dv}{v^2} = \int_0^T k dt$
 $\Rightarrow -\left(\frac{-1}{v}\right) \Big|_{20}^{10} = kt \Big|_0^T$
 $\Rightarrow \frac{1}{v} \Big|_{20}^{10} = kT$
 $\Rightarrow \frac{1}{10} - \frac{1}{20} = kT$
 $\Rightarrow \frac{1}{20} = kT$

$v \frac{dv}{dx} = -kv^2$
 $\Rightarrow \int_{20}^{10} \frac{dv}{v} = \int_0^{100} -k dx$
 $\Rightarrow \ln v \Big|_{20}^{10} = -kx \Big|_0^{100}$
 $\Rightarrow \ln 10 - \ln 20 = -k(100 - 0)$
 $\Rightarrow \ln \frac{10}{20} = -k(100)$
 $\Rightarrow \ln \frac{1}{2} = -k(100)$
 $\Rightarrow \ln(2^{-1}) = -k(100)$
 $\Rightarrow -\ln 2 = -k(100)$
 $\Rightarrow \frac{\ln 2}{100} = k$

Need k

$\therefore kT = \frac{1}{20} \Rightarrow \frac{\ln 2}{100} T = \frac{1}{20} \Rightarrow$

$T = \frac{5}{\ln 2}$