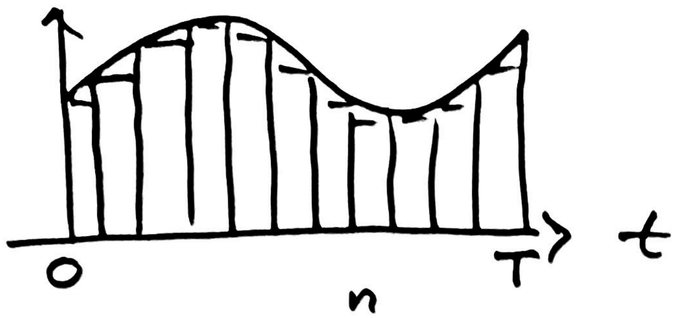
# 17.1 Samla resultat

13.04.23

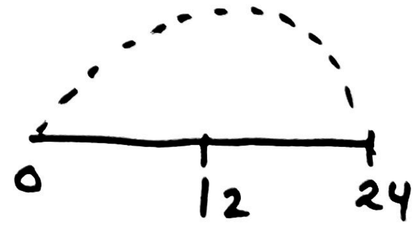
Effekt $P$



$$E \sim \sum_{i=0}^{n} P(t_i)(t_{i+1}-t_i)$$

$$E = \int_0^T P(t)\,dt$$

Eks $\quad P(t) = P_0 \sin\left(\frac{\pi t}{24}\right)$ $\quad$ $t$ tid enheter timer.



$$P_0 = 3\,\mathrm{kWh}/\mathrm{h}$$

$$\mathrm{kW} = 1000\,\mathrm{W} = 1000\,\mathrm{J}/\mathrm{sek}$$

$$\mathrm{kWh} = 1\,\mathrm{kW}\cdot(\underbrace{1\,\mathrm{time}}_{3600\,\mathrm{s}})$$

$$= 3600\,\mathrm{k}\underbrace{\mathrm{W}\cdot\mathrm{s}}_{\mathrm{Joule}}$$

$$= 3.6\,\mathrm{MJ}$$

$$E = \int_0^{24} P_0 \sin\left(\frac{\pi t}{24}\right) dt$$

$$E = P_0 \int_0^{24} \sin\left(\frac{\pi t}{24}\right) d$$

$$u = \frac{\pi t}{24}$$

$$du = \frac{\pi}{24} dt$$

$$\frac{24}{\pi} du = dt$$

$$E = P_0 \int_0^{\pi} \frac{24}{\pi} \sin U \, du$$

$$= P_0 \frac{24}{\pi} \underbrace{\int_0^{\pi} \sin(U) \, du}_{-\cos(u) \big|_0^{\pi}}$$

$$= P_0 \frac{24}{\pi} \big( \underbrace{-\cos(\pi) - (-\cos(0))}_{(1 + 1)} \big)$$

$$E = \frac{24}{\pi} \cdot 2 \, P_0 = \frac{48}{\pi} P_0$$

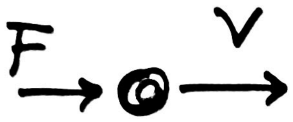
$$= \underline{\frac{48}{\pi} \cdot 3 \text{ kWh}}$$

Gjennomsnittlig forbruk i løpet av ett døgn er $\underline{\frac{2}{\pi} \cdot 3 \text{ kWh} / \text{h}}$

Energi = kraft × veg.

$$E = \int_{s_1}^{s_2} F(s)\,ds$$


$$F = m \cdot a = m \cdot v'$$




substitusjon.

$$\int F(s)\,ds = \int F(s(t))\frac{ds}{dt}\,dt$$

$$\int \underbrace{m \cdot v'}_{F} \cdot ds = \int m v' \cdot v\,dt$$

$$= m \int v \cdot v'\,dt \qquad v' = \frac{dv}{dt}$$

$$v'dt = dv$$

$$= m \int_0 v\,dv$$

$t = 0$ $v(0) = 0$ $v(T) = v$

Energien vi må tilføre for at objekte med masse m skal gå fra $v = 0$ til $v$ er

$$m\int v\,dv = m \cdot \frac{v^2}{2}\Big|_0^v = \underline{\frac{mv^2}{2}}$$

$$E = \int_{s_0}^{s_1} F(s)\,ds$$

$$F(s) = F_0 \sqrt{1+s}$$

$s_0 = 0 \qquad s_1 = 3$

$$E = F_0 \int_0^3 \sqrt{1+s}\,ds$$

$$= F_0 \int_0^3 (1+s)^{1/2}\,ds$$

$$= F_0 \cdot \frac{(1+s)^{3/2}}{3/2} \Big|_0^3$$

$$= F_0 \cdot \frac{2}{3}\left(4^{3/2} - 1^{3/2}\right)$$

$$(8 - 1)$$

$$= \underline{\frac{14}{3} F_0 \cdot (1\text{m})}$$

(med substitusjon

$1+s = u$

$u' = 1$

$du = ds$

$$E = F_0 \int_1^4 u^{1/2}\,du \ \ldots$$
)

$\underbrace{\underset{\text{pris/enhet}}{P} \cdot \underset{\text{enhete/tid}}{X}}_{\text{inntjening/tid}} \cdot \underset{\text{tid}}{T} = \text{inntjening.}$

inntjening $\sim$

$$\sum_{i=0}^{n} P(t_i) \cdot X(t_i) \cdot \overbrace{(t_{i+1} - t_i)}^{\Delta t_i}$$

$\Delta t_i \to 0$

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delvis integrasjon

$$\int \underset{u}{x} \underset{v'}{e^{ax}} \, dx = u \cdot v - \int u' v \, dx$$

$u = x \quad u' = 1$

$v' = e^{ax} \quad v = \frac{1}{a} e^{ax}$

$$\int x e^{ax} dx = x \cdot \left(\frac{1}{a} e^{ax}\right) - \int 1 \cdot \frac{1}{a} e^{ax} dx$$

$$= \frac{x}{a} e^{ax} - \frac{1}{a^2} e^{ax} + c$$

$$\underline{= \frac{1}{a^2} e^{ax} (ax - 1) + c}$$

Inntjening.

$P(t)$ pris per enhet

$$P(t) = P_0 e^{t/120} \qquad t \text{ mnd}$$

etter 1 år : $P(12) = P_0 e^{12/120} = P_0 e^{1/10}$

(ca 10.5% prisøkning)

antall enheter solgt / tid $\qquad 0 \leq t \leq 24$

$$X(t) = X_0 - X_0/4 \cdot \frac{t}{12} \qquad (2\text{ år})$$

Hva er inntjeningen de neste 2 årene?

$$\int_0^{24} P(t) \cdot X(t)\, dt.$$

$$I = \int_0^{24} P_0 e^{t/120} \cdot X_0 \left(1 - \frac{t}{48}\right) dt$$

$$= P_0 X_0 \int_0^{24} \underbrace{e^{t/120}}_{v'} \underbrace{\left(1 - \frac{t}{48}\right)}_{u} dt$$

$$= P_0 X_0 \left[ 120 e^{t/120} \left(1 - \frac{t}{48}\right) \Big|_0^{24} \right.$$

$$- \int_0^{24} 120 e^{t/120} \left(\frac{-1}{48}\right)$$

$$I = P_0 X_0 \left[ 120\, e^{1/5} \left(1 - \frac{1}{2}\right) - 120 \right.$$

$$\left. + \frac{120}{48} \int_0^{24} e^{t/120}\, dt \right]$$

$$= P_0 X_0 \left[ 120\left(\frac{1}{2} e^{1/5} - 1\right) + \frac{5}{2}\; 120\, e^{t/120} \Big|_0^{24} \right]$$

$$\underline{I = P_0 X_0 \left[ 120\, \frac{e^{1/5} - 2}{2} + 300\left(e^{1/5} - 1\right) \right]}$$