3. $P(t) = -t^3 + 33t^2 - 216t + 1000 \quad t \in [0, 24]$

a) $P(0) = -0^3 + 33 \cdot 0^2 - 216 \cdot 0 + 1000 = 1000\,MW$

$1000\,MW \cdot 24 = \underline{24000\,MW}$

b) $\int_0^{24} -t^3 + 33t^2 - 216t + 1000$

$= \int_0^{24} (-t^3) + \int (33t^2) - \int (216t) + \int (1000)$

$= \Big|_0^{24} -\frac{1}{4}t^4 + 11t^3 - 108t^2 + 1000t + C$

$= \left(-\frac{1}{4} \cdot 24^4 + 11 \cdot 24^3 - 108 \cdot 24^2 + 1000 \cdot 24\right) - 0$

$= 30912\,MW$

c) $\Big|_8^{16} -\frac{1}{4}t^4 + 11t^3 - 108t^2 + 1000t$

$= \left(-\frac{1}{4} \cdot 16^4 + 11 \cdot 16^3 - 108 \cdot 16^2 + 1000 \cdot 16\right)$

$\Rightarrow -\left(-\frac{1}{4} \cdot 8^4 + 11 \cdot 8^3 - 108 \cdot 8^2 + 1000 \cdot 8\right)$

$= 11328\,MW$

5. $v(t) = 50t + 130 \qquad (0 \le t \le 4)$

$$\int_{1,5}^{3} 50t + 130 \, dt$$

$$= \Big/_{1,5}^{3} 25t^2 + 130t$$

$$= (25 \cdot 3^2 + 130 \cdot 3) - (25 \cdot 1,5^2 + 130 \cdot 1,5)$$

$$= 363,75 \, m^3$$

15. $y = x^2 + 1$

$$\int_{-1}^{1} x^2 + 1 = \Big/_{-1}^{1} \frac{1}{3}x^3 + x$$

$$= \left(\frac{1}{3} \cdot 1^3 + 1\right) - \left(\frac{1}{3} \cdot (-1)^3 + (-1)\right)$$

$$= 2,666\ldots \text{ (P.a.y)} \approx 2,7 \text{ (P.a.y)}$$

16 $y = e^{3x} - 2$

$e^{3x} - 2 = 0 \quad |+2$

$e^{3x} = 2 \quad |\ln$

$3x = \ln(2) \quad |:3$

$x = \frac{\ln(2)}{3}$

$$\int_0^{\frac{\ln(2)}{3}} e^{3x} - 2 \, dx = \int_0^{\frac{\ln(2)}{3}} \frac{1}{3} 3e^{3x} - 2 \, dx \qquad D(3x) = 3$$

$$\left| \frac{1}{3} e^{3x} - 2x \right|_0^{\frac{\ln(2)}{3}}$$

$$= \left(\left(\frac{1}{3} e^{3 \cdot \frac{\ln(2)}{3}} - 2 \cdot \frac{\ln(2)}{3} \right) - \left(\frac{1}{3} \cdot e^{3 \cdot 0} - 2 \cdot 0 \right) \right)$$

$= -1288\ldots$ Ei $A \approx 0{,}13$ F.a.y

19. $f(x) = 6x^4 - 4x^2 + 1$ $\quad g(x) = 2x^4 - x^2 + 2$

$6x^4 - 4x^2 + 1 = 2x^4 - x^2 + 2$ $\quad | | -1$

$6x^4 - 4x^2 = 2x^4 - x^2 + 1$ $\quad | | -2x^4 \quad | | + x^2$

$4x^4 - 3x^2 = 1$ $\quad | | -1$

$4x^4 - 3x^2 - 1 = 0$

Otetaan nolla kohdat laskimella:

$x = 1$ tai $x = -1$

$$\int_{-1}^{1} [f(x) - g(x)]\, dx$$

$$= \int_{-1}^{1} (6x^4 - 4x^2 + 1) - (2x^4 - x^2 + 2)$$

$= -2{,}4$ Eli $A = 2{,}4$ P.a.y

21 $y = x^2 - 2$ $\quad y = x^2$ $\quad x = 0$ $\quad x = 3$

$$\int_{0}^{3} [f(x) - g(x)]\, dx$$

$$\int_{0}^{3} (x^2) - (x^2 - 2) = 6\ dm^2$$

$V = A \cdot h = 6\ dm^2 \cdot 0{,}05\ dm = 0{,}30\ dm^3$

$m = \rho V = 0{,}30 \cdot 10^{-3}\ m^3 \cdot 7800\ \frac{kg}{m^3} = 2{,}34\ kg$