Oppgave 2

a) $B(t) = \int \frac{d}{dt} B(t)\, dt$

$B(t) = \int \cos\left(\frac{\pi}{12}t\right) dt$

Setter $u = \frac{\pi}{12}t$

$\frac{du}{dt} = \frac{\pi}{12} \Rightarrow dt = \frac{12\, du}{\pi}$

$\Rightarrow \frac{12}{\pi} \int \cos(u)\, du = \frac{12}{\pi} \sin\left(\frac{\pi}{12}t\right) + C$

Setter inn $B(0) = 100$ for å finne C:

$\frac{12}{\pi} \sin\left(\frac{\pi}{12} \cdot 0\right) + C = 100$

$C = 100$

$B(t) = \frac{12}{\pi} \sin\left(\frac{\pi}{12}t\right) + 100$

B) $B(24) = \frac{12}{\pi} \sin\left(\frac{\pi}{12} \cdot 24\right) + 100$

$= \frac{12}{\pi} \sin(2\pi) + 100 = 100$

c) gjennomsnitt $= \frac{1}{b-a} \int_a^b B(t)\, dt$

$\frac{1}{24-0} \int_0^{24} B(t)\, dt$

$\frac{1}{24} \int_0^{24} \frac{12}{\pi} \sin\left(\frac{\pi}{12}t\right) + 100\, dt = \frac{1}{24}\left[-\cos\left(\frac{\pi}{12}t\right) + 100t\right]_0^{24}$

$= \frac{1}{24}\left(-\cos(2\pi) + 100 \cdot 24 - (-\cos(0) + 100 \cdot 0)\right)$

$= \frac{1}{24}\left(-1 + 2400 + 1 + 0\right) = \frac{2400}{24} = 100$

$B(t)_{avg} = 100$