1. So the solution to the transient problem is

$$w(x,t) = \widetilde{a_0} + \sum_{n=1}^{\infty} a_n \cos(\lambda_n x) e^{-\lambda_n^2 kt} \qquad \text{where } \lambda_n = \frac{n\pi}{L}$$

(a). Use the initial condition $w(x,0) = g(x) = f(x) - v(x) = f(x) - C_2$ to find $\widetilde{a_0}$.

Cosine Series $\Longrightarrow$

$$\begin{aligned}
\widetilde{a_0} &= \frac{1}{L}\int_0^L g(x)\,dx = \frac{1}{L}\int_0^L \qquad\qquad dx \\
&= \frac{1}{L}\int_0^L f(x)\,dx - \frac{1}{L}\int_0^L C_2\,dx \\
&= \frac{1}{L}\int_0^L f(x)\,dx - \qquad\qquad \Big|_0^L = \frac{1}{L}\int_0^L f(x)\,dx - \frac{1}{L}C_2(L-0) \\
&= \frac{1}{L}\int_0^L f(x)\,dx - \\
&= a_0 - C_2
\end{aligned}$$

where a_0 is the 0th coefficient for __________, not __________.

(b). Use the result of part(a) to write the solution for the transient $w(x,t)$.

(c). Write the full solution for $u(x,t)$ (simplify).

$u(x,t) = v(x) + w(x,t) =$

where $a_0 =$ and $a_n =$

(d). Compare the form of the solution for the transient $w(x,t)$ and the full solution $u(x,t)$.

Helpful time-saving tip

If the PDE and BC's are already homogeneous,