2 a) $\frac{\partial^2 w}{\partial t^2} = c^2 \frac{\partial^2 w}{\partial x^2}$

a1) $w(x,t) = \sin(x + c\cdot t)$

1. Partielle Ableitung nach t: $\frac{\partial w}{\partial t}(x,t) = \cos(x + c\cdot t)\cdot c$

2. Partielle Ableitung nach t: $\frac{\partial^2 w}{\partial t^2}(x,t) = \frac{\partial}{\partial t}(\cos(x + c\cdot t)\cdot c)$

$= -c^2 \sin(x + c\cdot t)$

1. Partielle Ableitung nach x: $\frac{\partial w}{\partial x}(x,t) = \cos(x + c\cdot t)$

2. Partielle Ableitung nach x: $\frac{\partial^2 w}{\partial x^2}(x,t) = \frac{\partial}{\partial x}(\cos(x + c\cdot t))$

$= -\sin(x + c\cdot t)$

$\frac{\partial^2 w}{\partial t^2} = c^2 \frac{\partial^2 w}{\partial x^2} \Rightarrow -c^2 \sin(x + c\cdot t) = c^2 \cdot (-\sin(x + c\cdot t))$

Formel ist erfüllt.

a2) $v(x,t) = \sin(x + c\cdot t) + \cos(2x + 2ct$

① $\frac{\partial^2 v}{\partial t^2}(x,t) = \frac{\partial}{\partial t}(\cos(x+ct)\cdot c - \sin(2x + 2ct)\cdot 2c)$

$= -\sin(x+ct)\cdot c^2 - \cos(2x + 2ct)\cdot 4c^2$

② $\frac{\partial^2 v}{\partial x^2}(x,t) = \frac{\partial}{\partial x}(\cos(x+ct) - \sin(2x + 2ct)\cdot 2)$

$= -\sin(x+ct) - \cos(2x + 2ct)\cdot 4$

$\frac{\partial^2 w}{\partial t^2} = c^2 \frac{\partial^2 w}{\partial x^2} \Rightarrow -\sin(x+ct)\cdot c^2 - \cos(2x + 2ct)\cdot 4c^2 = c^2 \cdot (-\sin(x+ct) - \cos(2x$

$+ 2ct)\cdot 4)$

Formel ist erfüllt.