Question 2.2:

Network 2: $\vec{a}^{(1)} = \tilde{W}\vec{a}^{(0)} + \tilde{b}$.

Network 1: $\vec{a}^{(1)} = W^{(1)}\vec{a}^{(0)} + \vec{b}^{(1)}$

$\vec{a}^{(2)} = W^{(2)}\vec{a}^{(1)} + \vec{b}^{(2)}$

$\vec{a}^{(3)} = W^{(3)}\vec{a}^{(2)} + \vec{b}^{(3)}$

$\therefore \vec{a}^{(3)} = W^{(3)}(W^{(2)}\vec{a}^{(1)} + \vec{b}^{(2)}) + \vec{b}^{(3)}$

$= W^{(3)}[W^{(2)}(W^{(1)}\vec{a}^{(0)} + \vec{b}^{(1)}) + \vec{b}^{(2)}] + \vec{b}^{(3)}$

$= W^{(3)}W^{(2)}W^{(1)}\vec{a}^{(0)} + W^{(3)}\vec{b}^{(1)} + W^{(3)}$ ×.

$= W^{(3)}W^{(2)}W^{(1)}\vec{a}^{(0)} + W^{(3)}W^{(2)}\vec{b}^{(1)} + W^{(3)}\vec{b}^{(2)} + \vec{b}^{(3)}$

$\therefore \tilde{W} = W^{(3)}W^{(2)}W^{(1)}$

$\tilde{b} = W^{(3)}W^{(2)}\vec{b}^{(1)} + W^{(3)}\vec{b}^{(2)} + \vec{b}^{(3)}$.