3a)

i) Initialize weights $(q_i \times k_j)$

$\text{score}_{11} = q_1 \cdot k_1 = (1\times1)+(2\times1)+(3\times1) = 6$

$\text{score}_{12} = q_1 \cdot k_2 = (1\times0)+(2\times0)+(3\times0) = 0$

$\text{score}_{13} = q_1 \cdot k_3 = (1\times2)+(2\times2)+(3\times0) = 6$

ii) scale w/ $\sqrt{|k_1|}$: $\sqrt{|k_1|} \approx 2$

$a'_{11} = 6/2 = 3$

$a'_{12} = 0/2 = 0$

$a'_{13} = 6/2 = 3$

b) Normalize weights (sum $= 3+0+3 = 6$)

$a_{11} = 3/6 = 0.5$

$a_{12} = 0/6 = 0$

$a_{13} = 3/6 = 0.5$

c) Weight 1: $0.5 \times v_1 = 0.5 \times [2,0,1] = [1.0, 0.0, 0.5]$

Weight 2: $0 \times v_2 = [0,0,0]$

Weight 3: $0.5 \times v_2 = 0.5 \times [1,2,2] = [0.5, 1, 1]$

Sum: $[1, 0, 0.5] + [0,0,0] + [0.5, 1, 1]$

$Z_1 = [1.5, 1.0, 1.5]$