rda Problem 3 Vector combination

$a := \binom{2}{-4}$ $b := \binom{-1}{5}$

$3a - 3x = 2x + 3b \quad | +3x$

$3a = 5x + 3b \quad | -3b$

$3a - 3b = 5x \quad | :5$

$\frac{3(a-b)}{5} = x$

$\frac{3 \cdot \left(\binom{2}{-4} - \binom{-1}{5}\right)}{5} = x \Rightarrow \frac{3 \cdot \binom{3}{-9}}{5} \Rightarrow \frac{\binom{9}{-27}}{5} \Rightarrow \begin{pmatrix} \frac{9}{5} \\ -\frac{27}{5} \end{pmatrix}$

check

$\binom{6}{-12} = \binom{9}{-27} + \binom{-3}{15}$

$\binom{6}{-12} = \binom{6}{-12}$

ii) $\lambda a + (1-\lambda) b, \quad 0 \leq \lambda \leq 1$

calculate x

~~check~~ i

$\lambda 2 + -1 + \lambda = 0$ $\quad \lambda = \frac{1}{3}$ $\quad -\frac{4}{3} + 5 - 5\lambda = x$

$\lambda 3 = 1 \quad | :3$ $\quad \frac{11}{3} - \frac{5}{3} = x$

b) $v_1 := \begin{pmatrix} 2 \\ 1 \\ -2 \end{pmatrix}$ $v_2 := \begin{pmatrix} 0 \\ 3 \\ 4 \end{pmatrix}$ $v_3 := \begin{pmatrix} 0 \\ 0 \\ -2 \end{pmatrix}$ $w := \begin{pmatrix} 1 \\ -4 \\ 6 \end{pmatrix}$ $\quad \frac{6}{3} = x$ $\quad x = 2$

I. $2x + 0y + 0z = 1 \rightarrow x = 0,5 \rightarrow$ insert in 2nd equation

II. $x + 3y + 0z = -4$ $\quad a_1 = 0,5$

III. $-2x + 4y - 2z = 6$ $\quad a_2 = -1,5$

$a_3 = -6,5$

$0,5 + 3y + 0z = -4 \quad | -0,5$

$3y = -4,5$

$y = -\frac{4,5}{3} = -1,5$ insert in III. equation

$-1 - 6 - 2z = 6$

$-2z = 13$

$z = -6,5$

Problem 4

a) $x \times y = y \times x$ is not true as $x \times y$ it use two different "formulas" as you calculate $x_2y_3 - y_2x_3$ in $x \times y$ in the first line and $y_2x_3 - y_3x$ in $y \times x$.

b) is not true because by the triangle unequality $\|u+v\| \leq \|u\| + \|v\|$ $\frac{y^u}{u+v}$.

example $u = \begin{smallmatrix}0\\1\end{smallmatrix}$ $v = \begin{smallmatrix}1\\0\end{smallmatrix}$

$\sqrt{(1)^2 + (1)^2} = \sqrt{2} < \sqrt{(1)^2} + \sqrt{(1)^2} = 2$

$\sqrt{2} < 2$

c) $\langle x + y, z\rangle = \langle x, z\rangle + \langle y, z\rangle$ is true as its just distributed $\langle x+y, z\rangle = (x+y) \cdot z = \ldots$

d) ~~The~~ λ exists only if ~~and~~ x and y are lineraly dependant (is not true)