$e_1 = x^0$
$e_2 = x^1$
$e_3 = x^2$
$e_4 = x^3$
$a = \alpha_1 e_1 + \alpha_2 e_2 + \alpha_3 e_3 + \alpha_4 e_4$
$b = \beta_1 e_1 + \beta_2 e_2 + \beta_3 e_3 + \beta_4 e_4$
$c = \gamma_1 e_1 + \gamma_2 e_2 + \gamma_3 e_3 + \gamma_4 e_4$
$a, b, c \in \mathbb{V}$
$\lambda, \mu \in \mathbb{F}$

1. $(a + b) + c = a + (b + c)$

$(a+b) = \alpha_1 e_1 + \alpha_2 e_2 + \alpha_3 e_3 + \alpha_4 e_4 + \beta_1 e_1 + \beta_2 e_2 + \beta_3 e_3 + \beta_4 e_4 = (\alpha_1 + \beta_1)e_1 + (\alpha_2 + \beta_2)e_2 + (\alpha_3 + \beta_3)e_3 + (\alpha_4 + \beta_4)e_4$

$(a+b)+c = (\alpha_1+\beta_1)e_1 + (\alpha_2+\beta_2)e_2 + (\alpha_3+\beta_3)e_3 + (\alpha_4+\beta_4)e_4 + \gamma_1 e_1 + \gamma_2 e_2 + \gamma_3 e_3 + \gamma_4 e_4 = (\alpha_1+\beta_1+\gamma)e_1 + (\alpha_2+\beta_2+\gamma)e_2 + (\alpha_3+\beta_3+\gamma)e_3 + (\alpha_4+\beta_4+\gamma)e_4$

$(b+c) = \beta_1 e_1 + \beta_2 e_2 + \beta_3 e_3 + \beta_4 e_4 + \gamma_1 e_1 + \gamma_2 e_2 + \gamma_3 e_3 + \gamma_4 e_4 = (\beta_1 + \gamma_1)e_1 + (\beta_2 + \gamma_2)e_2 + (\beta_3 + \gamma_3)e_3 + (\beta_4 + \gamma_4)e_4$

$a+(b+c) = \alpha_1 e_1 + \alpha_2 e_2 + \alpha_3 e_3 + \alpha_4 e_4 + (\beta_1+\gamma_1)e_1 + (\beta_2+\gamma_2)e_2 + (\beta_3+\gamma_3)e_3 + (\beta_4+\gamma_4)e_4 = (\alpha_1+\beta_1+\gamma)e_1 + (\alpha_2+\beta_2+\gamma)e_2 + (\alpha_3+\beta_3+\gamma)e_3 + (\alpha_4+\beta_4+\gamma)e_4$

$\implies (a + b) + c = a + (b + c) = a + b + c$

$a + b = b + a$
$a + 0 = a$
$\exists\, a' : a + a' = 0$
$1 \times a = a$
$\lambda(a + b) = \lambda \times a + \lambda \times b$
$(\lambda + \mu)a = \lambda \times a + \mu \times a$
$\lambda(\mu \times a) = \lambda\mu \times a)$