③ $\langle u, v+w\rangle = \langle u, v\rangle + \langle u, w\rangle$

$\langle u, v+w\rangle = \langle (3,-2), (4,5)+(-1,6)\rangle$

$= \langle (3,-2), (4-1, 5+6)\rangle$

$= \langle (3,-2), (3, 11)\rangle$

$= (3)(3) + (-2)(11)$

$= 9 - 22$

$= -13$

$\langle u, v\rangle + \langle u, w\rangle = \langle\langle (3,-2), (4,5)\rangle + \langle (3,-2), (-1,6)\rangle$

$= (3)(4) + (-2)(5) + (3)(-1) + (-2)(6)$

$= (12 - 10) + (-3 - 12)$

$= 2 + (-15)$

$= -13.$

④ $\langle ku, v\rangle = k\langle u, v\rangle = \langle u, kv\rangle$

$\langle ku, v\rangle = \langle (-4)(3,-2), (4,5)\rangle$

$= \langle (-12, 8), (4,5)\rangle$

$= (-12)(4) + (8)(5)$

$= -48 + 40$

$= -8$

$k\langle u, v\rangle = -4\langle (3,-2), (4,5)\rangle$

$= (-4)((3)(4) + (-2)(5))$

$= (-4)(12 - 10)$

$= -4(2)$

$= -8$