Theorem: Two vectors are equal iff their corresponding components are equal.

Example:- Let $\vec{v}$ be a vector in $\mathbb{R}^3$ such that $\vec{v} = (a+1, b-3, 3c+5)$ if you know that $\vec{v} = \vec{u}$ and $\vec{u} = (-2, 1, 11)$ find the value of a, b and c and the find the vector $\vec{w}$ if you know that:
$\vec{w} = (2a+1, 3b^2, (2c+1)^2)$

Sol $\because \vec{v} = \vec{u} \leftrightarrow a+1 = -2$ & $b-3 = 1$

& $3c+5 = 11 \leftrightarrow a = -3$ & $b = 4$ & $c = 2$

$\therefore \vec{w} = (2(-3)+1, 3(4)^2, (2(2)+1)^2)$
$= (-5, 48, 25)$

Definitions of addition, Subtraction & scalar multiplication

Theorem: If $\vec{v} = (v_1, v_2, v_3)$ and $\vec{w} = (w_1, w_2, w_3)$ and $k \in \mathbb{R}$, then:

1. $\vec{v} + \vec{w} = (v_1, v_2, v_3) + (w_1, w_2, w_3)$
$= (v_1 + w_1, v_2 + w_2, v_3 + w_3)$ {Addition}

2. $\vec{v} - \vec{w} = (v_1, v_2, v_3) - (w_1, w_2, w_3)$
$= (v_1 - w_1, v_2 - w_2, v_3 - w_3)$ {Subtraction}

3. $k\vec{v} = k(v_1, v_2, v_3)$
$= (kv_1, kv_2, kv_3)$ {Scalar multiplication}

These diffinitions are true for $\mathbb{R}^2$ also i.e.