

We can see from the figure that  $\vec{u} + \vec{v} = (-3, 4)$   
 And  $\vec{u} - \vec{v} = (7, 2)$

### Scalar multiplication

Let  $\vec{u} = (u_1, u_2)$  and let  $k$  be a scalar (any real number). Then,  $k\vec{u}$  is the vector that has the length to be  $|k|$  times the length of  $\vec{u}$  and

- (1) has the same direction as  $\vec{u}$  if  $k > 0$
- (2) has the opposite direction of  $\vec{u}$  if  $k < 0$ .

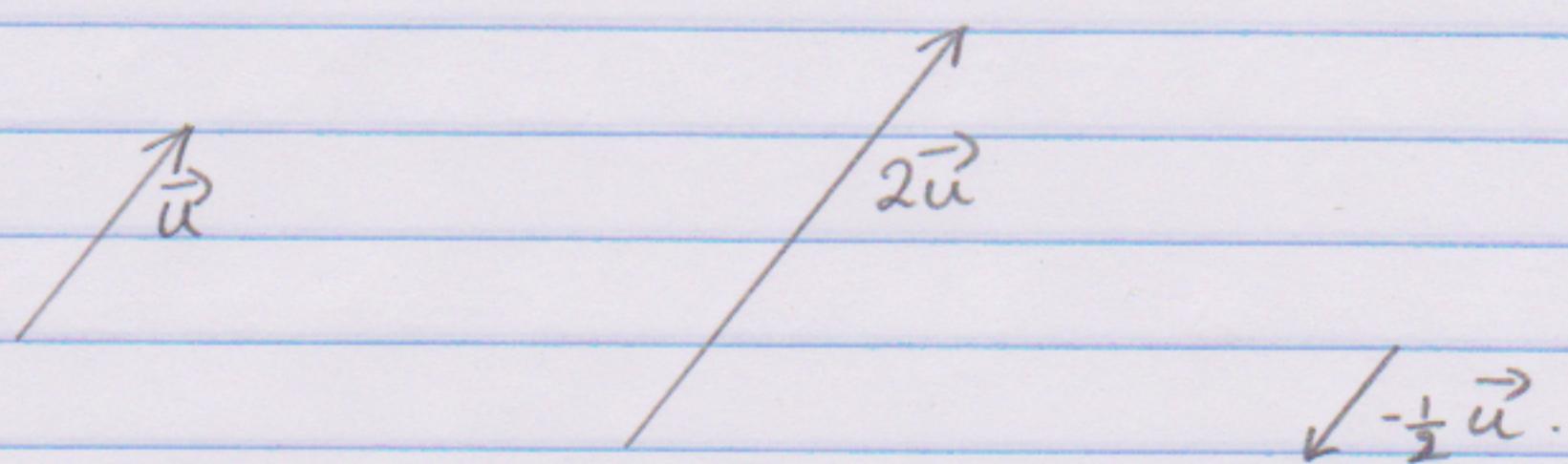
If  $k=0$ , then  $k\vec{u} = \vec{0}$  for any  $\vec{u} = (u_1, u_2)$

For example,  $\frac{1}{2}\vec{u}$  has the same direction as  $\vec{u}$

and is half the length of  $\vec{u}$

And  $-3\vec{u}$  has opposite direction of  $\vec{u}$  and has 3 times the length of  $\vec{u}$ .

### Example



Note: The zero vector  $\vec{0} = (0, 0)$