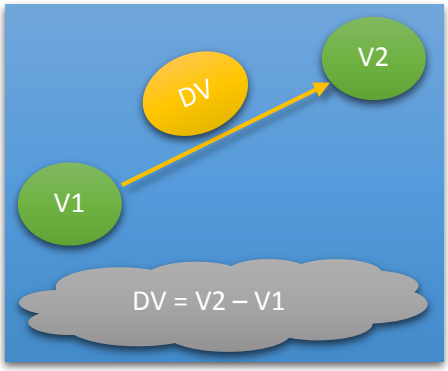
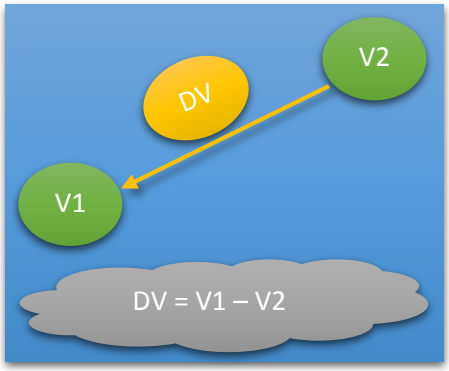
XNA Help

- To find a vector pointing to another vector we subtract the target from the current vector:
  - V1 : Vector 1
  - V2 : Vector 2
  - VD : The vector we want to figure out, Direction Vector





- Magnitude of a Vector ||V|| is (Length of vector)

$$||V|| = \sqrt{X^2 + Y^2}$$

- Unit Vector is a vector whose length is 1 (magnitude is 1) , also known as normalizing vector

$$\hat{V} = \frac{V}{||V||}$$

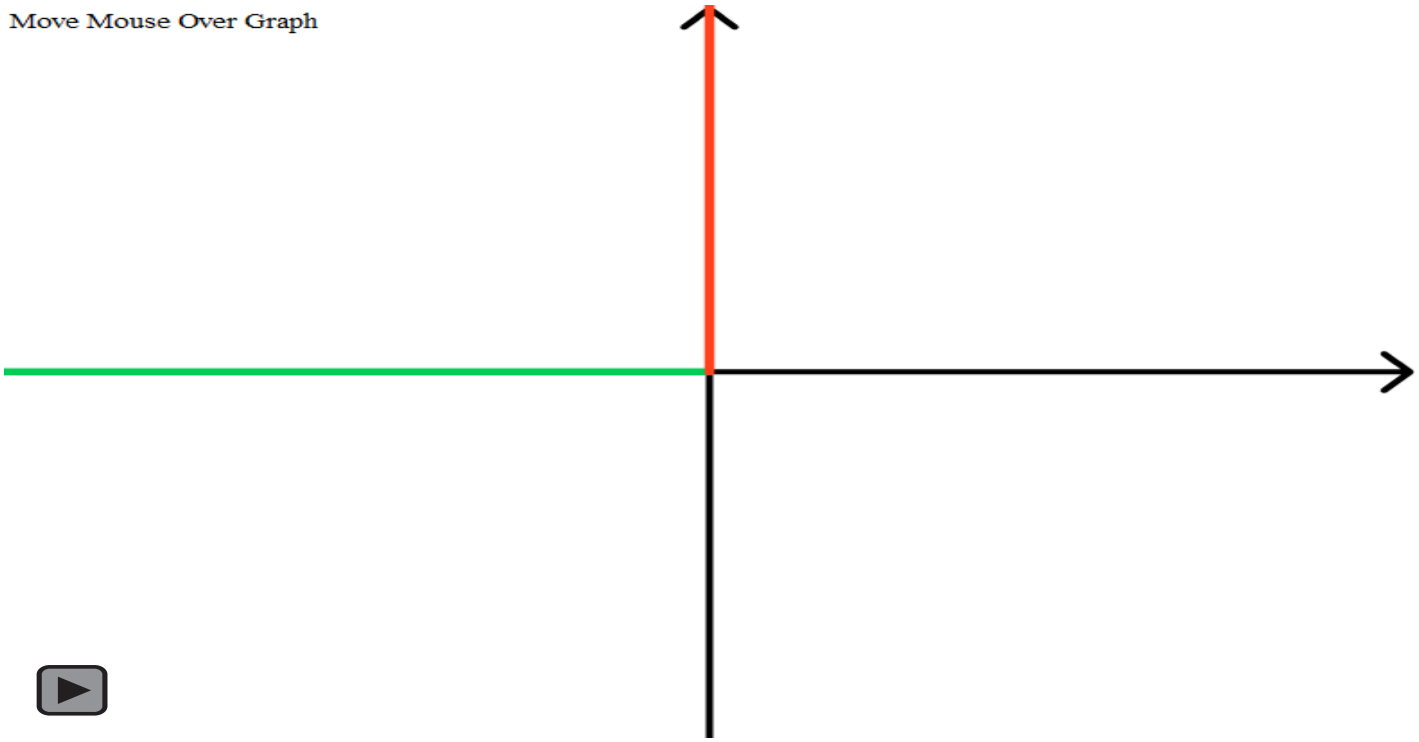
- To move object along the direction vector with user picked speed then you will need to normalize the vector then multiply the normalized vector by the speed (look at the next XNA code)

```
DirectionVector = VectorTarget - this.position;
DirectionVector.Normalize();
this.position += DirectionVector * Speed;
```

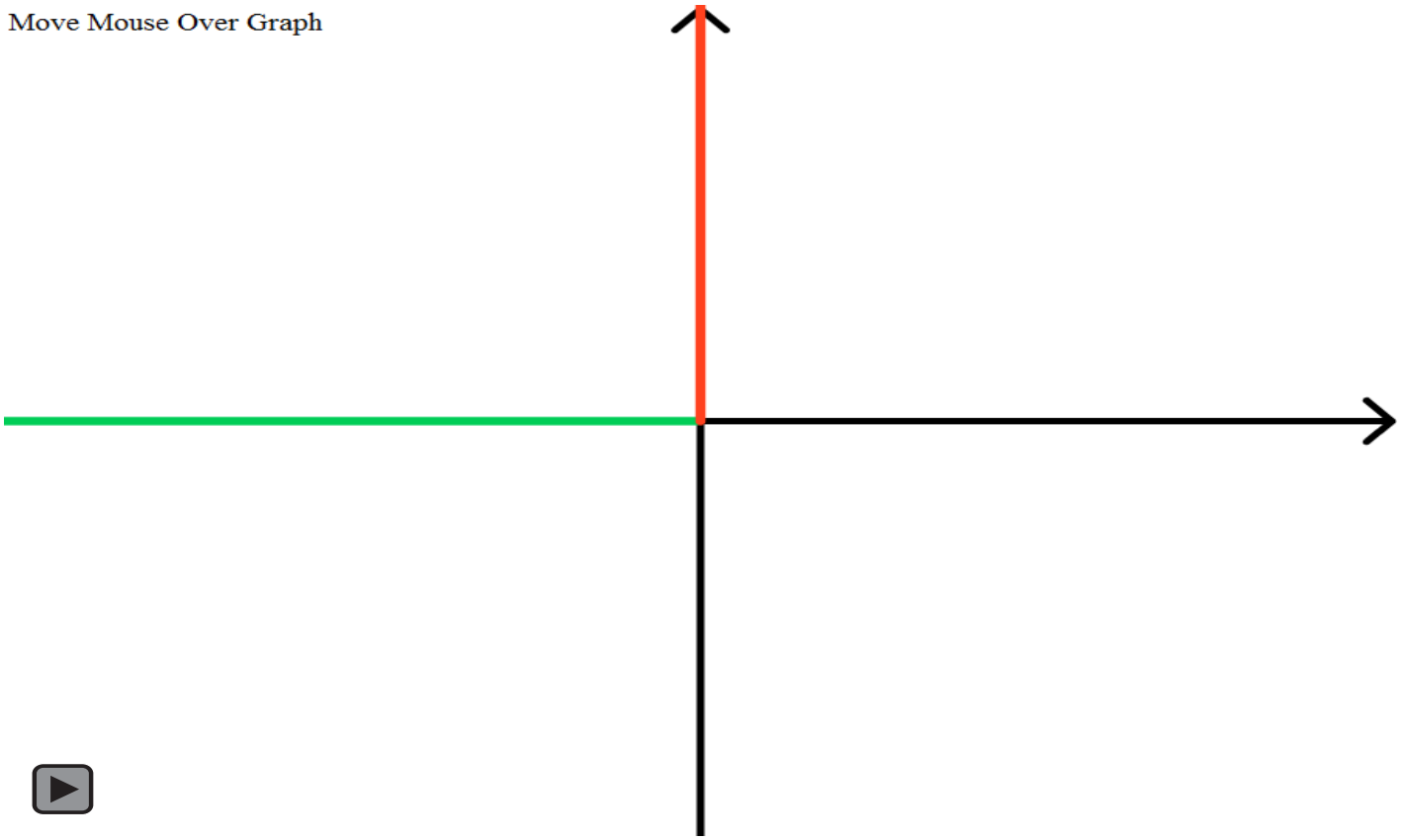
Created By Elhassan Ahmed , Date: 2/15/2015

- To Better Understand how vectors work take a look at next two interactive images
  - The two images assume that you want to move from position 0,0 to mouse position
  - The first one finding a vector
  - The second one finding and normalizing a vector

Move Mouse Over Graph



Move Mouse Over Graph



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- If you want to move the target in the direction it is looking using the angle then you can figure out the direction vector using the following

$$DV=(\cos\alpha\,,\sin\alpha)$$

  - Take Look at XNA code example

```
moveInDirectionVector = new Vector2(
     (float)Math.Cos(Rotation),
     (float)Math.Sin(Rotation));
this.position += moveInDirectionVector * Speed;
```

- To Find angel between two vectors from V1 to V2

$$\alpha = \tan^{-1}\left(\frac{V2.Y - V1.Y}{V2.X - V1.X}\right)$$

  - Take a look at the following function to find angle between two vectors in XNA

```
private float getAngleBetween(Vector2 vectorTo, Vector2 vectorFrom)
{
     return (float)Math.Atan2(vectorTo.Y - vectorFrom.Y,
                              vectorTo.X - vectorFrom.X);
}
```