

If given points :  $(x_1, y_1, z_1)$  and  $(x_2, y_2, z_2)$  then

**Vector Component Form:**

$$\mathbf{v} = \langle x_2 - x_1, y_2 - y_1, z_2 - z_1 \rangle$$

***The sum of unit vectors in 3 dimensions:***

$$\langle 8, -13, 2 \rangle = 8i - 13j + 2k$$

**Magnitude** (same as length or distance)

$$|\mathbf{u}| = \sqrt{(a_1)^2 + (a_2)^2 + (a_3)^2} \quad \text{if } \mathbf{u} = \langle a_1, a_2, a_3 \rangle$$

**Dot Product:**

$$\text{If } \vec{\mathbf{u}} = \langle a_1, a_2, a_3 \rangle \text{ and } \vec{\mathbf{v}} = \langle b_1, b_2, b_3 \rangle$$

$$\text{then } \mathbf{u} \cdot \mathbf{v} = a_1 b_1 + a_2 b_2 + a_3 b_3 \quad \leftarrow \text{multiply like components}$$

**If  $\mathbf{u} \cdot \mathbf{v} = 0$ , then vector  $\mathbf{u}$  and  $\mathbf{v}$  are perpendicular.**

**Notes: 9.3, 9.4**

**3-D Vectors**

## 9.3 #3-6 do not graph!!

write given problem

## 9.4 #3-35odd

and show work!

### 3-6 ■ ~~Plotting Points~~ and Finding Distance in Three Dimensions

Two points  $P$  and  $Q$  are given. ~~(a) Plot  $P$  and  $Q$ .~~ (b) Find the distance between  $P$  and  $Q$ .

3.  $P(3, 1, 0), Q(-1, 2, -5)$

4.  $P(5, 0, 10), Q(3, -6, 7)$

5.  $P(-2, -1, 0), Q(-12, 3, 0)$

6.  $P(5, -4, -6), Q(8, -7, 4)$

(a) Find vector  $v$  in component form

(b) Find the distance (magnitude)

3.  $\vec{PQ} = \langle -1-3, 2-1, -5-0 \rangle$   
 $= \langle -4, 1, -5 \rangle$

b.  $|\vec{PQ}| = \sqrt{(-4)^2 + (1)^2 + (-5)^2}$   
 $= \sqrt{16 + 1 + 25}$   
 $= \sqrt{42}$

## 9.3 #3-6 do not graph!

(a) Find vector  $v$  in component form

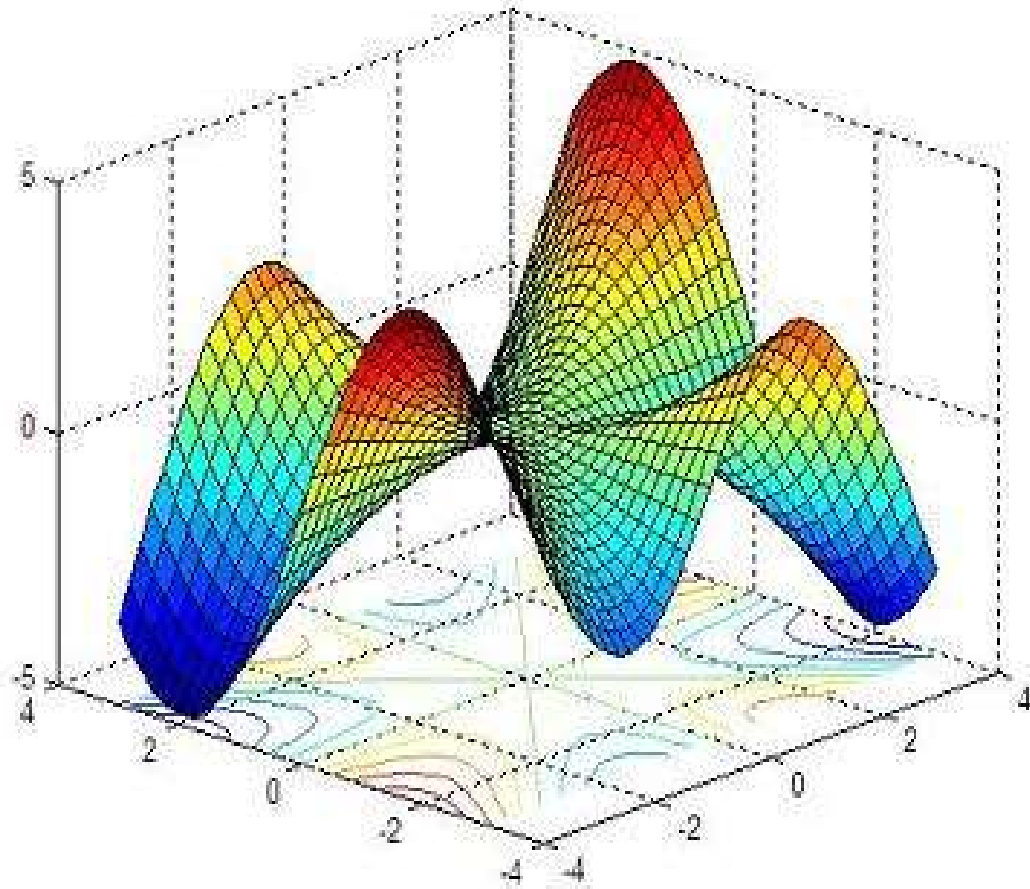
(b) Find the distance (magnitude)

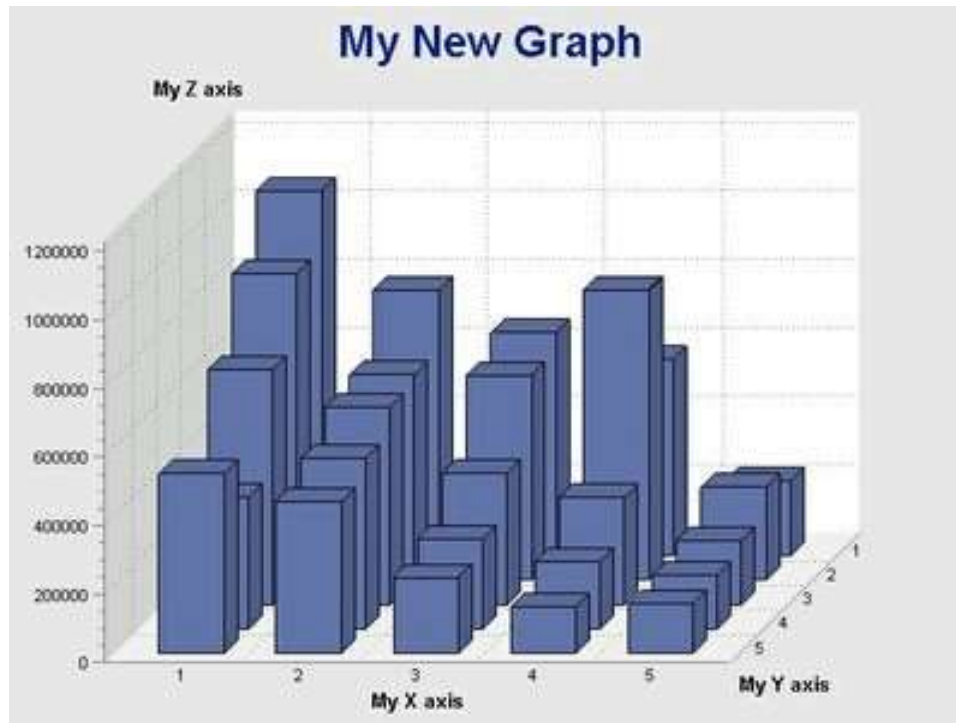
### 9.3 check even answers:

$$4. \quad \overrightarrow{PQ} = \langle -2, -6, -3 \rangle \quad \left| \overrightarrow{PQ} \right| = 7$$

$$6. \quad \overrightarrow{PQ} = \langle 3, -3, 10 \rangle \quad \left| \overrightarrow{PQ} \right| = \sqrt{118}$$

# 3-D Graphing





# Samples of 3-D graphs:

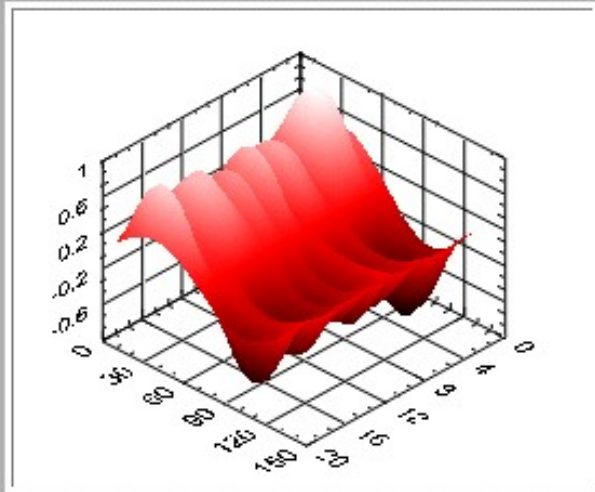
Click on the chart and gently move the mouse to rotate/spin the chart (or to see its values).  
 Hit enter for new X,Y, Z values, modify the Color/Chart title etc...

WPF 3D Chart Demo

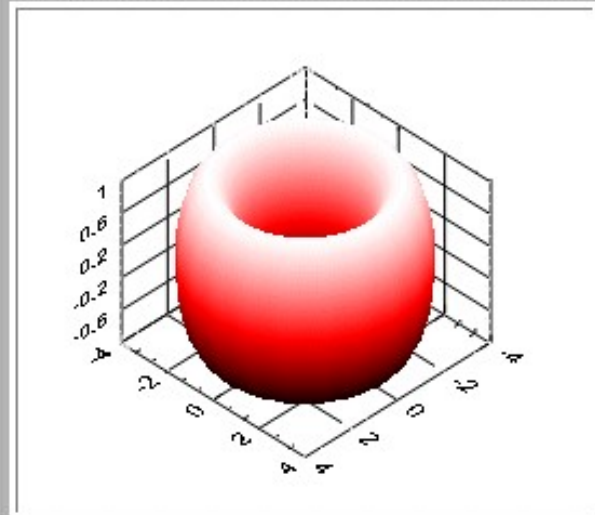
Chart Title:	WPF 3D Chart Demo
Z values:	0, 100, 200, 300, 400
Y values:	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Z values:	Color A, Color B, Color C
Colors:	Red, Green, Blue, Yellow
X Axis Color:	None
Y Axis Color:	Red, Green
Mouse sensitivity:	100

# Samples of 3-D graphs:

3D Surface



3D Parametric



Evolution of Spectra from HLNF  
Approximation of Longpass Filter

