Circle in space
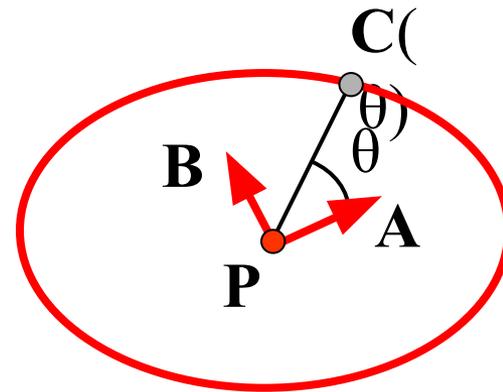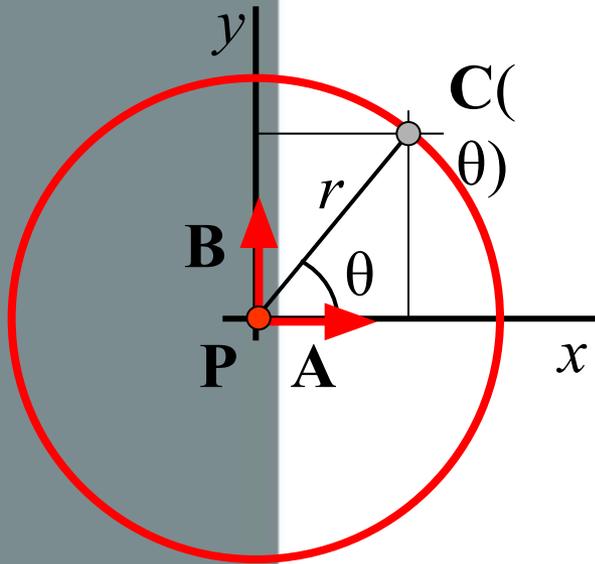
University of Sawa
College of Engineering Technology

Air Conditioning and Refrigeration Department

First Stage

Lect : Haider Abdl R Jassim

Lecture number : 4

Circle in space

$|\mathbf{A}|=1, |\mathbf{B}|=1, \mathbf{A}.\mathbf{B} = 0$

$\mathbf{C}(\theta) = (r \cos \theta, r \sin \theta, 0)$

$= (0,0,0) + r \cos \theta (1,0,0) + r \sin \theta (0,1,0)$

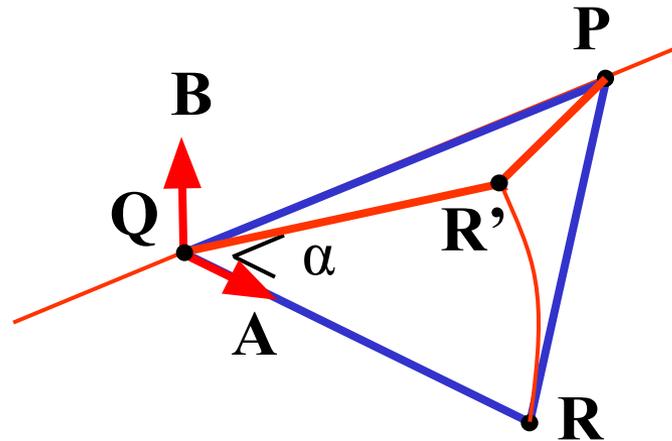$= \mathbf{P} + r \cos \theta \, \mathbf{A} + r \sin \theta \, \mathbf{B}$

Exercise 3

$$\mathbf{A} = (\mathbf{R} - \mathbf{Q}) / |\mathbf{R} - \mathbf{Q}|$$

$$\mathbf{B} = (\mathbf{R} - \mathbf{Q}) \times (\mathbf{P} - \mathbf{Q}) / | (\mathbf{R} - \mathbf{Q}) \times (\mathbf{P} - \mathbf{Q}) |$$

$$\mathbf{R'} = \mathbf{Q} + |\mathbf{R} - \mathbf{Q}| \cos \alpha \, \mathbf{A} + |\mathbf{R} - \mathbf{Q}| \sin \alpha \, \mathbf{B}$$

Use:

- Scalar product, cross product
- coordinate independent definitions
- vector algebra

Don't use:

- arccos, arcsin
- $y = f(x)$

Very short intro to Linear Algebra

System of linear equations:

$$u = 2x + 3y + 4z$$

$$v = x - 5y + 3z$$

$$w = 5x + y - z$$

Such systems occur in many, many applications. They are studied in Linear Algebra.

Very short intro to Linear Algebra

System of linear equations:

$$u = 2x + 3y + 4z$$

$$v = x - 5y + 3z$$

$$w = 5x + y - z$$

Typical questions:

- Given u, v, w, what are x, y, z?

- Can we find a unique solution?

Very short intro to Linear Algebra

System of linear equations:

$$u = 2x + 3y + 4z$$

$$v = x - 5y + 3z$$

$$w = 5x + y - z$$

Crucial in computer graphics:

- Transforming geometric objects
- Change of coordinates

H&B A-5

Example transformation

Transformation $\mathbf{P} \rightarrow \mathbf{P'}$:

$\mathbf{P} : (x, y)$

$\mathbf{P'} = x\mathbf{U} + y\mathbf{V}$, with

$\mathbf{U} = (3, 2)$

$\mathbf{V} = (-2, 3)$

In coordinates :

$x' = 3x + 2y$

$y' = -2x + 3y$

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