Warm - Up

Find the fourth root of:

$-2 + 2i$

SWBAT draw three dimensional figures and find values in three dimensional cartesion space

Agenda:

- Warm-Up
- Talk about grades
- Learn about 3D space

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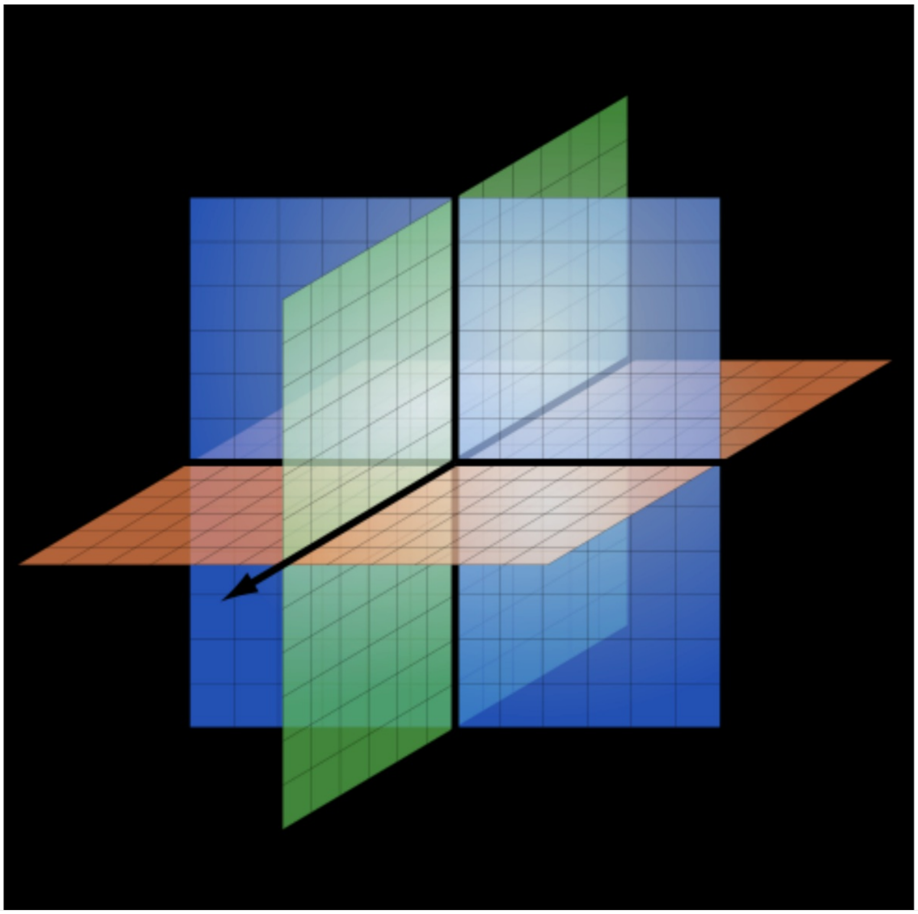

In three dimensional space, the cartesian plane becomes several planes.

They are xy plane, the xz plane, and yz plane and have equations $z = 0$, $y = 0$, and $x = 0$

Points on the planes have the form

$(x, y, 0)$ on the xy plane

$(x, 0, z)$ on the xz plane

$(0, y, z)$ on the yz plane

The coordinate planes divide space into eight regions called octants, with the first octant being with three positive coordinates.

Distance Formula

The distance d(P, Q) between the points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ in space is

$$d(P,Q) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

Midpoint Formula

The midpoint M of the line segment PQ with endpoints $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ is

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$$

Find the distance between P(-2, 3, 1) and Q(4, -1, 5) and find the midpoint of the line segment PQ

Standard Equation of a Sphere

A point $P(x, y, z)$ is on the sphere with center (h, k, l) and radisu r if and only if

$$(x - h)^2 + (y - k)^2 + (z - l)^2 = r^2$$

Find the standard equation of the sphere with center $(2, 0, -3)$ and radius 7.

Vectors in 3D space:
$v = <v_1, v_2, v_3> = v_1 i + v_2 j + v_3 k$

Given P(a, b, c) and Q(x, y z) then:
v = PQ = (x - a, y - b, z - c)

Vector v multiplyed by a scalar is:

$cv = c<v_1, v_2, v_3> = <cv_1, cv_2, cv_3>$

Vector Relationships in Space

For $v = <v_1, v_2, v_3>$ and $w = <w_1, w_2, w_3>$

Equality: $v = w$ iff $v_1 = w_1, v_2 = w_2, v_3 = w_3$
Addition: $v + w = <v_1+w_1, v_2+w_2, v_3+w_3>$
Subtraction: $v - w = <v_1 - w_1, v_2 - w_2, v_3 - w_3>$
Magnitude: $|v| = \sqrt{v_1^2 + v_2^2 + v_3^2}$
Dot Product: $v \bullet w = v_1 w_1 + v_2 w_2 + v_3 w_3$
Unit Vector: $u = v/|v|$

Practice:

1) 3<-2, 1, 4>

2) <0, 6, -7> + <-5, 5, 8>

3) |2, 0, -6|

4) <5, 3, -1>●<-6, 2, 3>

Exit Card

Given r = <-3, 4, 5>, a = <2, 0, 6>

Find the dot product of r•a