Warm-Up

SOLUTION!!!

Express the following as a complex number in standard form ($a + bi$).

$$3i^5 + (2i^6)^5 + \frac{(-1+2i)-3(2+i)}{(-2+i)^2}$$

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3i^5+(2i^6)^5+((
-1+2i)-3(2+i))/(
-2+i)²
      -32.68+1.76i
Ans▸Frac
   -817/25+44/25i
```

i^{30}

$32i^{30}$

$32(i^2)^{15}$

$= 3(i^2)^2 i + 32(i^2)^{15} + \frac{-1+2i-6-3i}{4-4i+i^2}$

$= 3(1)i + 32(-1) + \frac{-7-i}{3-4i}\left(\frac{3+4i}{3+4i}\right)$

$= 3i - 32 + \frac{-21-28i-3i-4i^2}{9-16i^2}$

$= 3i - 32 + \frac{-17-31i}{25}$

$= \frac{3i}{1} - \frac{32}{1} - \frac{17}{25} - \frac{31}{25}i$

$= -\frac{800}{25} - \frac{17}{25} + \frac{75}{25}i - \frac{31}{25}i$

$\boxed{= -\frac{817}{25} + \frac{44}{25}i}$

4. e) $\dfrac{2+i\sqrt{5}}{1-3i}\left(\dfrac{1+3i}{1+3i}\right)$

$= \dfrac{2+6i+i\sqrt{5}+3\sqrt{5}\,i^2}{1-9i^2}$

$= \dfrac{2-3\sqrt{5}+(6+\sqrt{5})i}{10}$

$= \dfrac{2-3\sqrt{5}}{10} + \dfrac{6+\sqrt{5}}{10}i$

Principle of Equality - "Comparison"

- comparison of left side versus right side.
- real parts must equal eachother and the imaginary parts must be equal.

EXAMPLE #1: $3 - i + 2i = 6i - (2x + yi)$ Solve for x & y:

$$3 + 1i = 6i - 2x - yi$$

Real = Real

$$\frac{3}{-2} = \frac{-2x}{-2}$$

$$x = \frac{-3}{2}$$

Im = Im ← Coefficients ONLY!!

$$1 = 6 - y$$

$$y = 5$$

EXAMPLE #2: $4i(3x - y) = 3 - (3 - yi)i$

$$12xi - 4yi = 3 - 3i + yi^2$$

$$12xi - 4yi = 3 - 3i - y$$

Real = Real

$$0 = 3 - y$$

$$y = 3$$

Im = Im

$$12x - 4y = -3$$

$$12x - 4(3) = -3$$

$$12x = 9$$

$$x = \frac{9}{12}$$

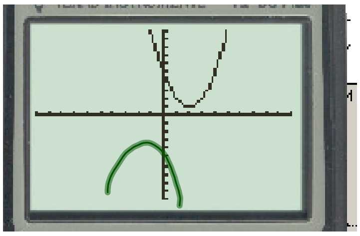
$$x = \frac{3}{4}$$

Complex Roots

- **If it is not possible to factor a quadratic equation and you cannot use the completing the square or quadratic formula because there is a negative under the radical sign.......**

There are no *x*-intercepts!!!!!!!

EXAMPLE: $y = 1x^2 - 4x + 5$, $\underline{\underline{x \in \mathbb{C}}}$



Look, it doesn't cross the *x*-axis

What happens if I try to use the quadratic formula?

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(+5)}}{2(1)}$$

a =
b =
c =

$$x = \frac{4 \pm \sqrt{-4}}{2}$$

$-1 = i^2$

No Solutions!!
$\{x \in \mathbb{R}\}$

$$x = \frac{4 \pm \sqrt{4i^2}}{2}$$

$$x = \frac{4 \pm 2i}{2}$$

$x = 2 \pm i \rightarrow x = 2 + i$

Homework...

Worksheet

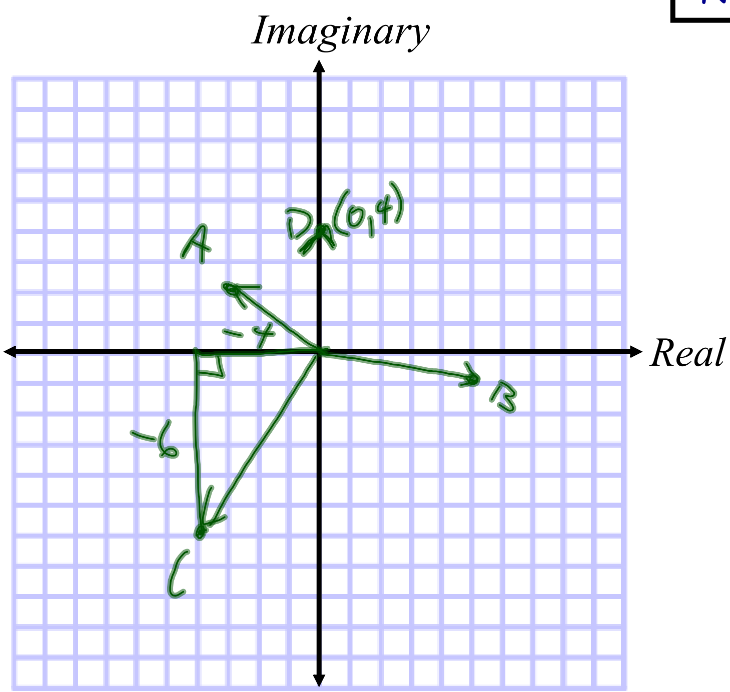
#5. 6, 7

Complex Plane (Argand Diagrams)

We can represent complex numbers in the **complex plane.**

We use the **horizontal axis** for the **real part** and the **vertical axis** for the **imaginary part.**

NOTE: $(x, y) = (\text{Re}, \text{Im})$



Examples:

A: $-3 + 2i \Rightarrow (-3, 2)$

B: $5 - i$ $(5, -1)$

C: $-4 - 6i$ $(-4, -6)$

D: $4i$ $(0, 4)$

Referred to as an ARGAND DIAGRAM

~~$|-8| = 8$~~

- the magnitude of a complex vector uses the notation $|a+bi|$ where the length is determined by the Pythagorean Theorem

$|a+bi| = \sqrt{a^2+b^2}$

Not Absolute Value

EXAMPLE... (B) $|-2-4i|$

$= \sqrt{(-2)^2+(-4)^2}$

$= \sqrt{4+16}$

$= \sqrt{20}$

$= 2\sqrt{5}$

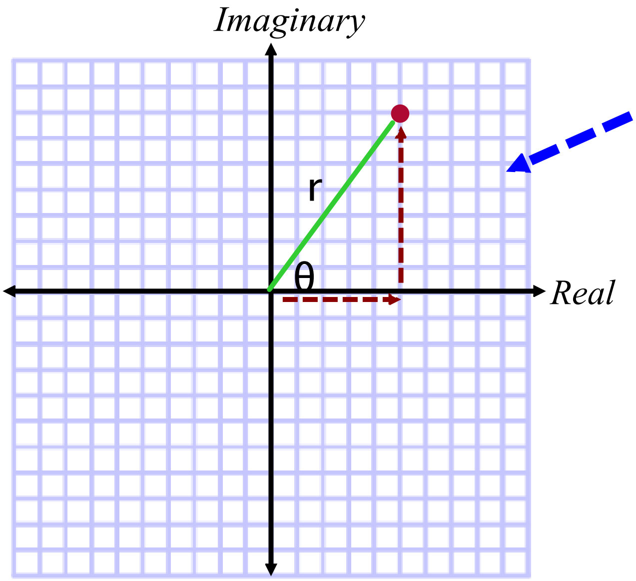
Polar Coordinate System

Graphing system that plots ordered pairs of the form (r ,θ).

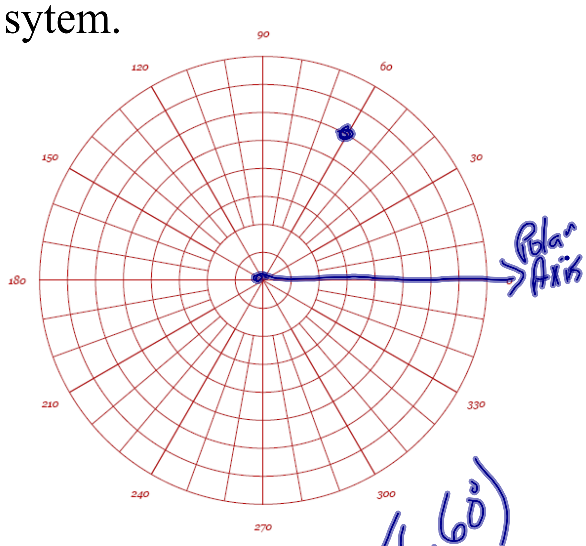
- "r" is the absolute value or modulus. The distance from the origin to the point.

- θ is the angle of rotation from the starting position, referred to as the "pole".

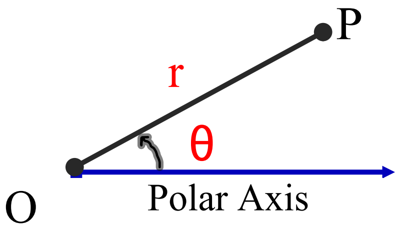
- to locate a point, start with the point O, called the **pole** and a particular ray with its endpoint at O along the **polar axis**.



This is referred to as a rectangular coordinate sytem.



(6, 60°)

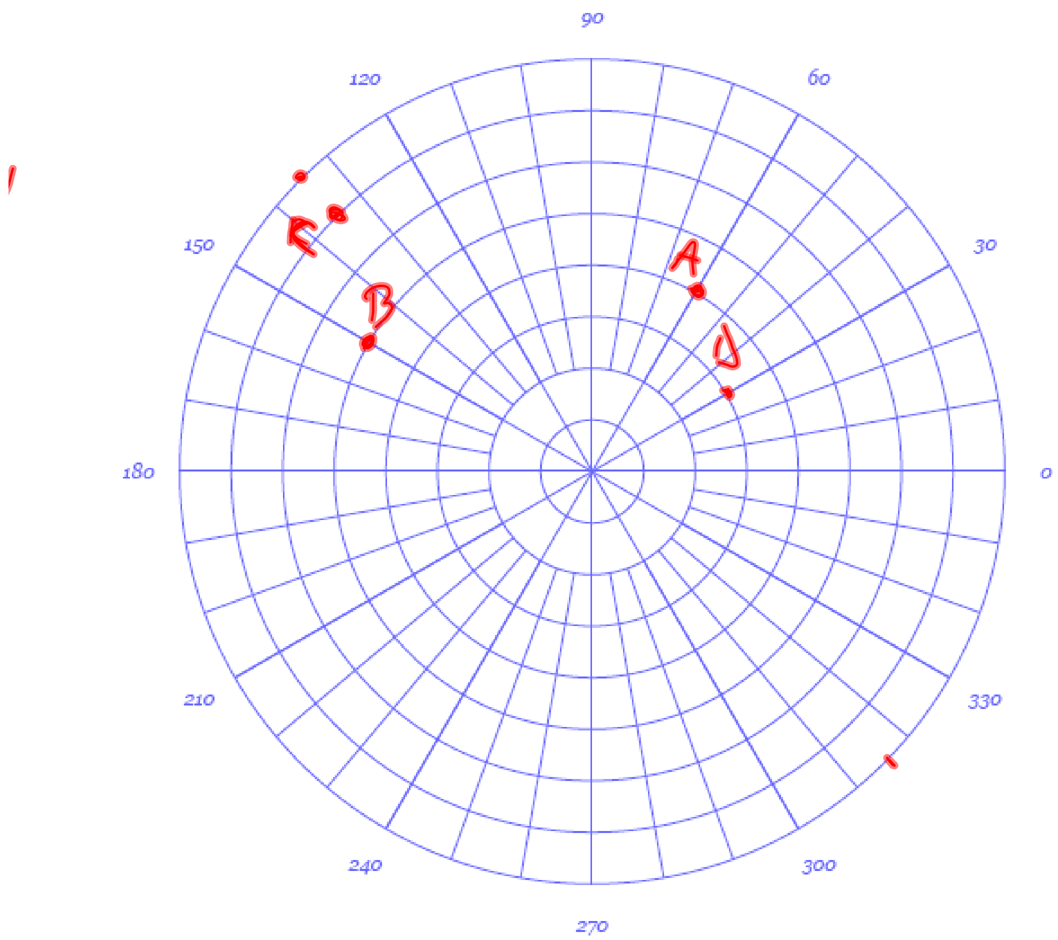


The ordered pair (r, θ) is referred to as the polar coordinates of P

Plotting Polar Coordinates:

Plot each of the following points:

A $(4, 60^o)$ B $(5, -210^o)$ C $(-7, 315^o)$ D $(-3, -150^o)$



MORE EXAMPLES...

A $(2, 45^{o})$

B $(-3, 225^{o})$

C $(1, 450^{o})$

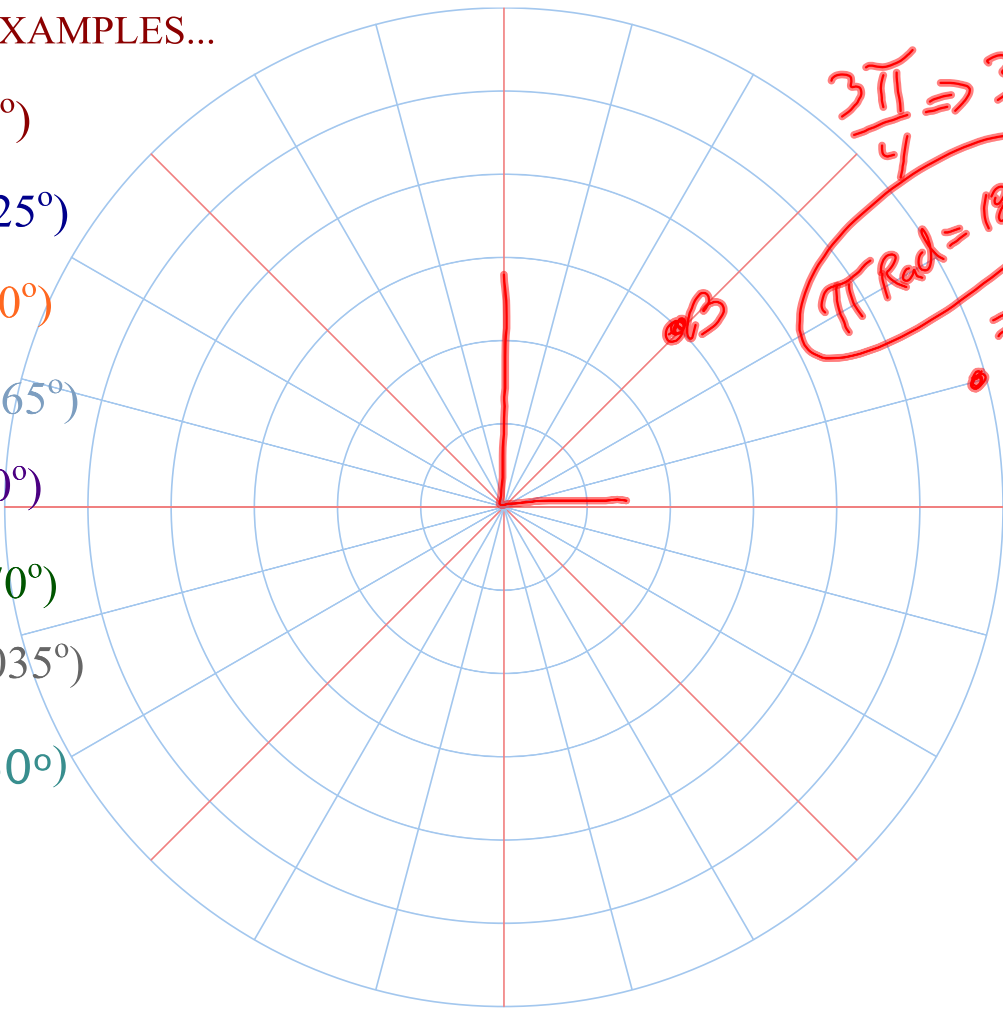
D $(-6, -165^{o})$

E $(4, 240^{o})$

F $(-2, 270^{o})$

G $(4, -1035^{o})$

H $(-2, -60^{o})$



$\frac{3\pi}{4} \Rightarrow \frac{3(180^\circ)}{4}$

π Rad $= 180^\circ$

$= 135^\circ$

Homework...

Assignment - Plotting Polar Coordinates.doc

Attachments

Worksheet - Plotting Polar Coordinates.doc