Accelerated Pre-Calculus

February & March 2023

Unit 7 – Polar Graphs & Complex Numbers

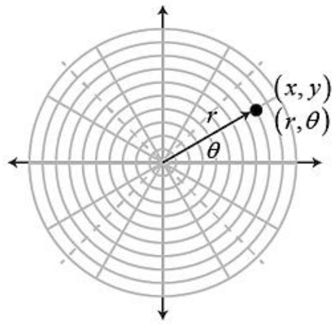
Monday	Tuesday	Wednesday	Thursday	Friday
Feb 13	14	15	16 7.01 Polar Coordinates • Plot points • Multiple representations HW: 7.01 Practice	17 7.02 Polar Coordinates • Convert btw Rectangular & Polar • Multiple representations • Distance Formula HW: 7.02 Practice and
20 **No School** **President's Day**	21 **No School** **Teacher Workday**	22 7.03 Polar Coordinate Review	23 **7.04 Quiz- Polar Coordinates & Converting Points with Rectangular System** HW: Polar Review	23 7.05 Complex Numbers in Rectangular Form • Absolute Value • Modulus • Distance Between • Midpoint HW: 7.05 Practice
27 7.06 Adding & Subtracting Complex Coordinates Geometrically HW: 7.06 Practice	28 **Check-In Quiz** 7.07 Complex Numbers in Polar Form • Modulus and Argument HW: 7.07 Practice	Mar 1 7.08 Operations with Complex Numbers in Polar Form • Product • Quotient HW: 7.08 Practice	2 7.09 More Complex Number Operations • Power • Roots HW: 7.09 Practice	3 7.10 More Practice with Operations HW: 7.11 Review
6 7.11 Review HW: Finish Review	7 ACT Day 7.11 Review HW: Study!	8 **Test: Polar and Complex**	9 TASK: Battleship - Star Wars Edition!	10

Homework Keys:

tinyurl.com/MiltonAPC

Polar Coordinates, (r, θ):

$x = r\cos\theta$
$y = r\sin\theta$



$r = \sqrt{x^2 + y^2}$
$\theta = \tan^{-1}\left(\frac{y}{x}\right) + 0°/180°/180°/360°$

Distance between two points on the polar plane: $\sqrt{{r_1}^2 + {r_2}^2 - 2r_1r_2\cos(\theta_2 - \theta_1)}$

Complex Numbers, Rectangular (Standard) form: z = a + bi

Absolute value (modulus): $|z| = \sqrt{a^2 + b^2}$

Distance between 2 complex numbers is the modulus of their difference: $|z_1 - z_2|$

Midpoint between 2 complex numbers is the average of the values: $\frac{z_1+z_2}{2}$

Polar (Trigonometric) Form of a complex number: $\boldsymbol{z = r(\cos\theta + i\sin\theta)}$ **or** $\boldsymbol{r\ cis\ \theta}$
Where $a = r\cos\theta$, $b = r\sin\theta$, $r = \sqrt{a^2 + b^2}$, and $\tan\theta = \frac{b}{a} + 0°/180°/180°/360°$

	Coordinates	Complex Numbers
Rectangular Form: **Formulas:**	$\boldsymbol{(x, y)}$ $x = rcos\theta$ $y = rsin\theta$	$\boldsymbol{a + bi}$ $a = rcos\theta$ $b = rsin\theta$
Polar Form: **Formulas:**	$\boldsymbol{(r, \theta)}$ $r = \sqrt{x^2 + y^2}$ $\theta = tan^{-1}\left(\frac{y}{x}\right) + 0°/180°/180°/360°$	$\boldsymbol{r(cos\theta + isin\theta)}$ $r = \sqrt{a^2 + b^2}$ $\theta = tan^{-1}\left(\frac{b}{a}\right) + 0°/180°/180°/360°$

Multiplication of Complex Numbers
$z_1 \cdot z_2 = r_1r_2[\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)]$

Division of Complex Numbers
$\frac{z_1}{z_2} = \frac{r_1}{r_2}[\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)], r_2 \neq 0$

De Moivre's Theorem (Powers of a Complex Number)
$$z^n = [r(\cos\theta + i\sin\theta)]^n = r^n(\cos n\theta + i\sin n\theta)$$

nth Roots of a Complex Number
$\sqrt[n]{r}\left(\cos\frac{\theta + 2\pi k}{n} + i\sin\frac{\theta + 2\pi k}{n}\right), k = 0,1,2,\ldots,n-1$