Trig, Polar Coordinates, and Complex Numbers

I. Graphing and reading trigonometric functions

   a. **Always check if the problem you are working on is asking for radians or degrees, and if your calculator is in the right mode.**

   b. The window set by ZTrig is based on whether radian or degree mode is selected. If a graph doesn't look right, although ZTrig had been used, it may be because the mode (rad/deg) had been changed midway. If so, get into the right mode, and use ZTrig.

      i. Window set by ZTrig (Radian mode):

$$Xmin \approx -2\pi$$

$$Xmax \approx 2\pi$$

$$Xscl = \frac{\pi}{2}$$

$$Ymin = -4$$

$$Ymax = 4$$

$$Yscl = 1$$

      ii. Window set by ZTrig (Degree mode):

$$Xmin = -352.5°$$

$$Xmax = 352.5°$$

$$Xscl = 90°$$

$$Ymin = -4$$

$$Ymax = 4$$

$$Yscl = 1$$

c. **Graph: y $= 2\cos^2 x$ and find an equation of the form**

y = k + A*sin(Bx + C)

Amplitude = A   Period $= \dfrac{2\pi}{B}$ Phase Shift $= \dfrac{-C}{B}$

** All graphing features used with regular functions applies to

trigonometric functions as well **

We can find the amplitude by using maximum/minimum finders.

We can find the period and phase shift by tracing values.

II.   Polar Coordinates

    a. Pay attention to what mode (degrees or radians) the problem is asking for, and always make sure the calculator is in the right mode.

    b. The ANGLE menu

        i. Press ⬚2nd⬚ and then ⬚MATRX⬚

        ii. R ▸ Pr(converts a rectangular form to r in polar coordinates.

        iii. R ▸ P θ (converts a rectangular form to the θ in polar coordinates.

        iv. P ▸ Rx(converts a polar form to the rectangular x-coordinate.

        v. P ▸ Ry(converts a polar form to the rectangular y-coordinate.

        vi. The ⬚,⬚ button is located above the "seven" button.

    c. Converting from polar to rectangular (to three decimal places)

        i. $(7, 2\pi/3)$

            Rectangular form is:

        ii. (-9.028, -0.663)

            Rectangular form is:

d. Converting from rectangular to polar (in degrees)

    i. (6.9, 4.7)

       Polar form is:

    ii. (16, -27)

       Polar form is:

e. Graphing polar graphs

    i. Change to RADIAN in the MODE menu.

    ii. Change to POL (polar) in the MODE menu.

    iii. Change to PolarGC in FORMAT menu (press $\boxed{\text{2nd}}$, then $\boxed{\text{ZOOM}}$).

    iv. Enter equation and graph like usual. When entering the variable θ , the same button ($\boxed{\text{X.T. } \theta \text{ .n}}$) is used when graphing functions of x.

    v. In order to draw the graph proportionately, use ZSquare in the ZOOM menu. ZSquare slightly adjusts the window to make the graph appear horizontally and vertically proportional.

    vi. **Graph r = 8*cos(2θ).**

    vii. **Graph r = 6*sin(3θ).**

III. Complex numbers

    a. Degrees and radians are important here, too!

    b. **How do we convert -7-4i to polar form (in degrees; two decimal places)?**

        i. While working with complex numbers, it is easier to read answers that have a fixed number of decimal places. **How do you change the number of decimal places the answers are given in?**

        ii. Is the MODE correct?

        iii. Enter the expression. **How do we type in the 'i'?**

        iv. Conversion feature is located in the MATH menu. Once in MATH, use the right arrow to go to CPX. Then, conversion to polar is feature number 7. Select this and press ENTER.

        v. **Answer:**

    c. **Convert 6-5i to polar form (in radians, two decimal places).**

d. **How do we convert 5.71e$^{(-0.48)i}$ to rectangular form (two decimal places)?**

    i. Is the MODE correct?

    ii. Enter the expression.

    iii. The conversion to rectangular form is feature 6. Select this and press ENTER.

    iv. **Answer:**

e. **Convert 6.83e$^{(-108.82°)i}$ to rectangular form (two decimal places.**