Note 10A • Unit Circle

Follow these steps to graph a unit circle:

a. Press \( \text{MODE} \) and set \( \text{Graph} \) to \( \text{PARAMETRIC} \) and \( \text{Angle} \) to \( \text{DEGREE} \).

b. On the \( Y= \) Editor screen, enter the equations \( x(t) = \cos(t) \) and \( y(t) = \sin(t) \).

c. Set the Window Editor screen to

\[
\begin{align*}
\text{T}_{\text{min}} &= 0 \\
\text{T}_{\text{max}} &= 900 \\
\text{T}_{\text{step}} &= 15 \\
\text{X}_{\text{min}} &= -3.95 \\
\text{X}_{\text{max}} &= 3.95 \\
\text{X}_{\text{scl}} &= 1 \\
\text{Y}_{\text{min}} &= -1.9 \\
\text{Y}_{\text{max}} &= 1.9 \\
\text{Y}_{\text{scl}} &= 1
\end{align*}
\]

d. Display the graph.

Now you can press \([\text{Trace}]\) to find coordinates of points on the circle.

Note 10B • Radian Mode

In Radian mode, the calculator treats the input of a sine, cosine, or tangent function as a radian measure instead of a degree measure. It also returns a radian measure when you use the inverse functions. To put the calculator in Radian mode, press \([\text{MODE}]\) and set \( \text{Angle} \) to \( \text{RADIAN} \).

Overriding Radian or Degree Mode

In Radian mode, enter a degree symbol, \( \degree \), after the input if you want the calculator to override the Radian mode and treat the input as a degree measure. To find the degree symbol, press \([\text{2nd}] \ [\text{°}]\).
In Degree mode, enter a radian symbol, \( ^\circ \), after the input if you want the calculator to override the Degree mode and treat the input as a radian measure. To find the radian symbol, press \( \text{[MATH]} \ 2: \text{ANGLE} \ 2: \text{r} \).

Converting Between Radians and Degrees
You can use the override feature to convert an angle measure from radians to degrees or from degrees to radians.

For example, follow these steps to convert 30° to radians:

a. Set the calculator to Radian mode.

b. On the Home screen, enter 30 and press \( \text{[°]} \).

c. Press \( \text{[ENTER]} \). Whether the calculator gives you the radian measure as a decimal approximation or as a multiple of \( \pi \) depends upon the Exact/Approx setting in the Mode window. So, 30° is equivalent to \( \frac{\pi}{6} \) radians.

For another example, follow these steps to convert \( \frac{7\pi}{12} \) radians to degrees:

a. Set the calculator to Degree mode.

b. On the Home screen, press \( \text{[7]} \ 2\text{nd} \text{[\pi]} \ 12 \ 2\text{nd} \text{[MATH]} \ 2:\text{Angle} \ 2: \text{r} \).

c. Press \( \text{[ENTER]} \). So, \( \frac{7\pi}{12} \) radians is equivalent to 105°.

Note 10C • Secant, Cosecant, and Cotangent
If the calculator has the most current operating system (version 2.08 or higher), it has built-in functions for secant, cosecant, and cotangent, and their inverses. To find these functions, press \( \text{[MATH]} \ A:\text{Trig} \), and select the appropriate function.
Note 10C • Secant, Cosecant, and Cotangent (continued)

Older operating systems do not have built-in secant, cosecant, or cotangent functions. You must calculate these functions by using the appropriate reciprocal identities. To find the inverse of a secant, cosecant, or cotangent function, use the reciprocal identity's inverse with the reciprocal of the input. This screen shows how to calculate $\sec\frac{\pi}{6}$ and $\sec^{-1}(3)$ on a TI-92 Plus by using cosine and inverse cosine.

In Auto or Exact mode, pressing [ENTER] after a secant, cosecant, or cotangent expression returns an exact value when possible; pressing [ ] gives a decimal approximation. In Auto or Exact mode, pressing [ENTER] after an inverse secant, inverse cosecant, or inverse cotangent expression often returns an equivalent trigonometric expression; pressing [ ] gives a decimal approximation.

Note 10D • Collecting Sound Frequency Data

You need a CBL2 and the datamate program to collect sound frequency data. Press 2nd [VAR-LINK] and check that you have datamate loaded. To load datamate, connect the CBL2 and calculator, put the calculator in Receive mode ([VAR-LINK] 2:Receive), and press [TRANSFER] on the CBL2.

Plug the microphone probe into channel CH 1 of the CBL2, and connect the calculator to the CBL2. Enter datamate() on the Home screen and press [ENTER]. If the program does not recognize the microphone, follow these steps:

a. Select 1:SETUP.

b. Press [ENTER] for CH 1.

c. Choose 4:MICROPHONE from the second list of choices.

d. Enter the type (1, 2, or 3) as listed on the side of your microphone.

e. Select 1:OK to return to the data collection menu.

Ring a tuning fork and press 2:START to run the program. In a moment the CBL2 will beep as it begins to collect data. Since it collects data for only 0.02 second, it will beep again almost immediately to signal when it stops collecting. The calculator will display a graph. If the graph does not look like a sinusoidal curve, press [ENTER] and select 2:START to try again. If you continue to have trouble collecting good data, adjust the microphone’s position.

(continued)
Note 10D • Collecting Sound Frequency Data (continued)  

When you have good data, choose 6:QUIT. The calculator will tell you that time data are stored in list l1 and sound frequency data are stored in list l2.

Note 10E • Polar Coordinates

Graphing Polar Equations

Follow these steps to graph a polar equation:

a. Press MODE and set Graph to POLAR and Angle to DEGREE.

b. On the Y= Editor screen, enter a function in the form $r = f(\theta)$.

   Press 9(θ) to get $\theta$. (On a TI-92 Plus or a Voyage 200, press θ.)

c. On the Window Editor screen, set values of $\theta$ as well as $x$ and $y$.

d. Display the graph.

Tracing Polar Coordinates

No matter what mode you're in, you can find the polar coordinates of a point on a graph by pressing F1 (Tools) 9:Format and setting Coordinates to POLAR. Then when you trace or move the cursor about the screen, you will see coordinates in the form ($r, \theta$).

[-7.9, 7.9, 1, -3.8, 3.8, 1]

Remember to change the format back to 1:RECT in order to display coordinates in the form ($x, y$).