Toolkit for the TI-82 and the TI-83

GETTING STARTED

The bottom cover has a battery cage. Open the cage cover by pressing the horizontal finger in the middle toward the cage cover and then lifting the cage cover. Insert 4 alkaline batteries with labels nearest the bottom of the calculator arranged from left to right: $-\ +\ -+$. Then snap the cage cover back on again.

Turn the calculator right side up. Open by sliding the upper cover away from you.

To turn on: press `ON` (bottom left). To turn off: press `2nd ON`

After approximately 5 minutes without activitiy, the calculator automatically turns off, remembering what is on the screen and function equations.

To increase screen contrast, press `2nd` ↑ To decrease contrast, press `2nd` ↓

Symbols at the upper left of the buttons are accessed by pressing `2nd` and then the appropriate key: Thus $\sqrt{3}$ is obtained by pressing `2nd` x^2 `3` and π is obtained by pressing `2nd` ^

Symbols at the upper right of the buttons are "alphabetical," and are accessed by pressing `ALPHA` and then the appropriate key. Thus `P` is obtained by pressing `ALPHA 8`

You should check that the calculator is reset to its factory settings. On the TI-83, press `2nd + 5 ENTER` (in order to clear any junk in the memory). On the TI-82: `2nd + 3 ENTER`

To obtain a blank screen, press `CLEAR` or `2nd MODE`
You can also turn off the calculator: `2nd ON`
You can recall and edit the previous expression by pressing `2nd ENTER`

↑ sends the cursor up one line; → sends the cursor to the right one character; similarly for ← and ↓.

Pressing `DEL` deletes a character: To delete 9 in 123945, press ← until the cursor is over 9, and press `DEL` . Pressing `2nd DEL` inserts a character: To insert 3 midway in 1245, press ← until the cursor is over 4, and press `2nd DEL 3`

On the TI-83, for the `X,T,θ,n` key, `X` is for the x in $f(x)$, `T` is for parametric equations, θ is for polar coordinates, and `n` is for the index of a sequence. To see which is current, press `MODE` ; the fourth line has Func Par Pol Seq. Below we will write `X` for the `X,T,θ,n` key. On the TI-82, the corresponding key is `X,T,θ` .

ENTERING MATHEMATICAL EXPRESSIONS

For -3:	press `(-) 3` (note that the (-) key toggles plus or minus sign; $-$ is for subtraction)
For x^2:	press `X` x^2 (alternatively, press `X ^ 2`)
For $x^{2/3}$:	press `X ( 2 ÷ 5 )`
For $1/x$:	press `1 ÷ X` (or press `X` x^{-1})
For $\sqrt{x-5}$:	On the TI-83 press `2nd` x^2 `X − 5 )` On the TI-82, `2nd` x^2 `( X−5 )`
For $\lvert 4-x\rvert$:	On the TI-83 press `MATH → 1 4 − X )` On the TI-82, `2nd` x^{-1} `( 4 − X )`
For $\sin \pi^4$:	On the TI-83 press `SIN 2nd ^ 4 )` On the TI-82, `2nd LN ( 3 X )`
For e^{3x}:	On the TI-83 press `2nd LN 3 X )` On the TI-82, `2nd LN ( 3 X )`
For $\dfrac{x\sqrt{x}-1}{x^2+1}$:	press `( X 2nd` x^2 `X − 1 ) ÷ ( X` x^2 `+ 1 )`

To find the value of any expression at, say, $x = 2$, you can either press `2` instead of `X` as you enter the expression, or you can press `2 STO X ENTER` before entering the expression.

In Math 140-141, have angles set to `RADIANS` (To find out if they are, press `MODE` . If on the third line `DEG` is shaded, press ↓ ↓ ← `ENTER` so that `RAD` is shaded.)

ENTERING FUNCTIONS

To enter a function, press `Y=` and then the expression:
for $f(x) = x^2$, press `Y= X` x^2 `ENTER` (the top line reads $\mathrm{Y}_1 = \mathrm{x}^2$).
If there was an expression already in Y_1, you can erase it by `CLEAR`.
To access Y_2, either press `ENTER` or press $\downarrow$.

To find iterates of a number such as .3 for $f(x) = x - x^2$, do the following:
`.3 STO X ENTER X - X` (this yields $\mathrm{x} - \mathrm{x}^2$) `STO X`
Press `ENTER` to find $f(.3)$, `ENTER` again to find $f(f(.3))$, etc.

GRAPHING FUNCTIONS and ZOOMING IN

To graph a function such as $x^3 - 2x - 2$, press `Y=` , key in `X^3 - 2 X - 2`, and then `ENTER GRAPH`
The standard viewing window of -10 to 10 on each axis is obtained by pressing `ZOOM 6 ENTER`

Notice that $f(c) = 0$ for a value of c near to 1.7. To find a good approximation for c, we will zoom in.
Press `TRACE` to put the cursor on the graph, then press $\rightarrow$ or $\leftarrow$ until the cursor is nearest to the x axis. The bottom of the screen displays the coordinates after each stroke of $\rightarrow$ or $\leftarrow$. For example, one such set is `X=1.7894737 Y=.15133401`. Then press `ZOOM 2 ENTER` (which zooms in on the region centered at the exhibited coordinates). Repeat the sequence: `TRACE` $\rightarrow$ or $\leftarrow$, $\rightarrow$ or $\leftarrow$, etc., until the cursor is nearest the x axis, and then `ZOOM 2 ENTER` Do until you achieve a satisfactory accuracy. We may obtain the following:

$\mathrm{x} = 1.7631579 \quad \mathrm{y} = -.0451414$
$\mathrm{x} = 1.7697368 \quad \mathrm{y} = -.00328634$
$\mathrm{x} = 1.7680921 \quad \mathrm{y} = -.0088636$
$\mathrm{x} = 1.7693257 \quad \mathrm{y} = 2.4616\,\mathrm{E} - 4$ (that is, .00024616)

CAUTION: The coordinates exhibited at the bottom of the screen are only approximate. It is not accurate to say that $c = 1.7693257$.

FOR LATER USE (at the end of Chapter 2): If we use the $\rightarrow$ button and find two successive points "on" the graph such that the y values are of opposite sign, and if the function is continuous, then we know that c lies in the corresponding interval on the x axis (by the Intermediate Value Theorem). In our example above, two successive iterates of the $\rightarrow$ button yield

$\mathrm{x} = 1.7685033 \quad \mathrm{y} = -.0058288 \qquad \text{and} \qquad \mathrm{x} = 1.7693257 \quad \mathrm{y} = 2.4616\,\mathrm{E} - 4$

The y values have different signs, so that c lies in the interval $(1.7685033, 1.7693257)$.

NUMERICAL DERIVATIVE: Press `MATH 8` to access nDeriv(. There are four components:
nDeriv(function, variable, number at which the derivative is to be evaluated, desired accuracy).
For example, suppose we wish to find the derivative of x^3 at 2.6, with an accuracy of 0.01. Then we would do the following: nDeriv`(x^3,x,2.6,.01)`. The answer appears as 20.2801. If we wish 0.001 accuracy, then we obtain 20.280001.

NUMERICAL INTEGRAL: Press `MATH 9 ENTER` to access fnInt(. There are five components:
fnInt(function, variable, lower limit of integration, upper limit of integration, desired accuracy).
For example, suppose we wish to find the integral of $1/x$ on the interval $[1, 3]$, with an accuracy of 0.1. Then we would do the following: fnInt`(1÷x,x,1,3,.1)`. The answer appears as 1.098612289.

READ THE TEXAS INSTRUMENTS MANUAL FOR MUCH MORE INFORMATION.