Numerical integration on TI-83/84 and TI-85/86 calculators

Most graphing calculators have a built-in numerical integration feature that essentially computes a Riemann sum approximation for a given definite integral. On the TI-83/84 and TI-85/86 models, the relevant command is \texttt{fnInt}. You can use \texttt{fnInt} directly or you can go through an option under the graphing mode. Directions for each procedure are below for the TI-83/84 and on the next page for the TI-85/86.

**TI-83/84**

**Direct**
Under the \texttt{MATH} menu, choose \texttt{9:fnInt(}. The \texttt{fnInt} command has four required arguments:

- an expression for the integrand
- the name of the integration variable
- the lower limit of integration
- the upper limit of integration

For example, to get a numerical estimate of $\int_{0}^{10} \cos(x^2) \, dx$, enter

\[
\texttt{fnInt(cos(X^2),X,0,10)}
\]

This should return the value 0.6011251848.

On a TI-83/84, \texttt{fnInt} has an optional fifth argument to specify a target accuracy for the result. We’ll discuss this later in the class when we cover numerical integration in more depth.

**Graphing mode**

1. Start by entering the integrand using the \texttt{Y=} button.

2. Use \texttt{GRAPH} to have a plot made.

3. Under the \texttt{CALC} menu (accessed as the \texttt{2nd} option on the \texttt{TRACE} button), choose \texttt{7: \int f(x) \, dx}. This will take you back to the plot window where you will see the prompt \texttt{Lower Limit?} toward the bottom of the screen.

4. Enter a lower limit either by typing a value or by “driving” to the relevant value using the left and right arrow buttons.

5. Press \texttt{ENTER} to bring up the new prompt \texttt{Upper Limit?}

6. Enter an upper limit either by typing a value or by “driving” to the relevant value using the left and right arrow buttons.

7. Press \texttt{ENTER} to start the calculation. When complete, the result is returned at the bottom of the screen and the relevant region is shaded in on the plot.
Direct
Under the CALC menu (using the 2nd option on the ÷ button), choose fnInt. The fnInt
command has four required arguments:

- an expression for the integrand
- the name of the integration variable
- the lower limit of integration
- the upper limit of integration

For example, to get a numerical estimate of \( \int_{0}^{10} \cos(x^2) \, dx \), enter

\[
\text{fnInt}(\cos(x^2),x,0,10)
\]

This should return the value 0.601125184811.

On a TI-85/86, fnInt does not have an optional fifth argument to specify a target accuracy
for the result. You can change the target accuracy by specifying a value for the built-in variable
TOL. This variable is accessible under TOL on the MEM menu (using the 2nd option on the 3
button).

Graphing mode

1. Start by entering the integrand using the y(x)= item under the GRAPH menu.
2. Use GRAPH under the GRAPH menu to have a plot made.
3. On the GRAPH menu, use MORE to go to MATH menu.
4. Under the MATH menu, choose \( \int f(x) \). This will take you back to the plot window where
you will see the prompt Lower Limit? toward the bottom of the screen.
5. Enter a lower limit either by typing a value or by “driving” to the relevant value using the
left and right arrow buttons.
6. Press ENTER to bring up the new prompt Upper Limit?
7. Enter an upper limit either by typing a value or by “driving” to the relevant value using
the left and right arrow buttons.
8. Press ENTER to start the calculation. When complete, the result is returned at the bottom
of the screen and the relevant region is shaded in on the plot.