

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 `fnInt`. You can use `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 **MATH** menu, choose **9: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 0.6011251848.

On a TI-83/84, `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 **Y=** button.
2. Use **GRAPH** to have a plot made.
3. Under the **CALC** menu (accessed as the 2nd option on the **TRACE** button), choose **7:∫f(x)dx**. This will take you back to the plot window where you will see the prompt **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 **ENTER** to bring up the new prompt **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 **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 \div 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.