11. DERIVATIVES

A. Numerical Approximations

\[ \lim_{x \to a} \frac{f(x) - f(a)}{x - a} \] can be approximated using the methods of the last section.

So can \( \lim_{H \to 0} \frac{f(a+H) - f(a)}{H} \). Just assign values to \( H \) instead of to \( x \).

Unfortunately, you cannot use a lower case \( h \).

Example: Approximate \( f'(\pi/3) \) for \( f(x) = \sin x \).

I selected Float 4 on the MODE menu to round to 4 places, and I will use the list stored in \( V \) in Section 10.A.iv. On the home screen, enter

\[ V \text{ STO} \cdot \ H: (\sin(\pi/3+H) - \sqrt{3}/2)/H \ \text{ ENTER} \]

The calculator returns the list:

\{.2674 .3636 .4559 .4957 .4996 .4999 .5000\}

Recall the last command using ENTRY and change \( V \) to \(-V\) to check the limit from the left.

Of course, there is no good reason other than notational conformity to use \( H \) instead of \( V \) in the expression. One could omit the \text{STO}\cdot command and substitute \( V \) for \( H \).

You can enter \( \frac{f(a+H) - f(a)}{H} \) on the \( y(x) = \) screen using a small value for \( H \) and graph. The graph will approximate the graph of \( f' \).