

Example 1. Let $f(x) = 4x^3 + 3x^2 - 6x$.

- (a) Using your calculator, graph $f(x)$. Use a window that shows all the “interesting” features (in particular it should show the local max/mins).
- (b) Describe the critical points, the local max and mins, and where the function is increasing/decreasing.
- (c) Take the first derivative of $f(x)$, find the critical points algebraically.
- (d) Summarize your work in a “1D# table” (1st Derivative Number Line Table) table that shows the first derivative test and the conclusions that it gives you.

Example 2. Let $f(x) = e^{-2x} + 5x$.

- (a) Using your calculator, graph $f(x)$. Use a window that shows all the “interesting” features (in particular it should show the local max/mins).
- (b) Describe the critical points, the local max and mins, and where the function is increasing/decreasing.
- (c) Take the first derivative of $f(x)$, find the critical points algebraically.
- (d) Summarize your work in a “1D# table” (1st Derivative Number Line Table) table that shows the first derivative test and the conclusions that it gives you.

Example 3. The function $f(x) = \frac{\ln(x)}{x}$ has a critical point at $x = e$. Use the second derivative test to identify it as a local max/min.