

First derivative using the abbreviated central differentiation method

Calculates the first derivative of f using the abbreviated central differentiation numerical method.

By using $f'(x) \approx \frac{f(x+h) - f(x-h)}{2h}$, we calculate an approximation to the first derivative of f , where the error of said method is $O(h^2)$. The difference between this and the standard method is the presence of less terms of the Taylor's series' expansion, which creates a bigger error.

Parameters

1. $f \rightarrow$ The symbolical function to calculate its derivative.
2. $h \rightarrow$ The absolute value of the difference between $f(x+h)$ and $f(x)$ or $f(x)$ and $f(x-h)$.
3. $x \rightarrow$ The point where the derivative will be calculated.
4. $df \rightarrow$ The symbolical derivative to calculate the error of the method.

Returns

1. $dfa \rightarrow$ The value of the derivative calculated using the numerical method in p .
2. $h \rightarrow$ The absolute value of the difference between $f(x+h)$ and $f(x)$ or $f(x)$ and $f(x-h)$.
3. $error \rightarrow$ The absolute error between the numerical method and the actual derivative.

```
function [dfa, h, error] = abbreviatedCentralFirstDerivative(f, df, x, h)
    format longE
    dfa = (f(x+h) - f(x-h))/(2*h);
    error = abs(df - dfa);
end
```