CS 1173: MATLAB diff function

The diff function returns the differences of adjacent elements along an array dimension.

\[ B = \text{diff}(A, 1, \text{dim}) \]

resulting differences array to diff dimension to diff over

**Example 1: Different ways to apply diff to array A**

\[ A = \begin{bmatrix} 1 & 2 & 6; 4 & -7 & 0 \end{bmatrix}; \]
\[ B = \text{diff}(A, 1, 1); \]
\[ C = \text{diff}(A, 1, 2); \]

**A**

\[ \begin{bmatrix} 1 & 2 & 6 \ 4 & -7 & 0 \end{bmatrix} \]

\[ B = \text{diff}(A, 1, 1) = \begin{bmatrix} 3 & -9 & -6 \end{bmatrix} \]

\[ C = \text{diff}(A, 1, 2) = \begin{bmatrix} 1 & 4 \ -11 & 7 \end{bmatrix} \]
CS 1173: MATLAB diff function (1 argument)

When you call `diff` with only one argument, `diff` calculates the first difference along the first non-singleton dimension.

\[
B = \text{diff}(A)
\]

resulting difference array to difference

Example 1: A has both rows and columns

\[
A = \begin{bmatrix} 1 & 2 & 6 \\ 4 & -7 & 0 \end{bmatrix};
B = \text{diff}(A(:));
C = \text{diff}(A);
\]

The first non-singleton dimension is 1

\[
A = \begin{bmatrix} 1 & 2 & 6 \\ 4 & -7 & 0 \end{bmatrix};
B = \text{diff}(A(:)) = \begin{bmatrix} 3 \\ -2 \\ -9 \\ 13 \\ -6 \end{bmatrix};
C = \text{diff}(A) = \begin{bmatrix} 3 & -9 & -6 \end{bmatrix}
\]

Example 2: A has just one row

\[
A = [1, 2, 6];
B = \text{diff}(A);
\]

The first non-singleton dimension is 2

\[
A = \begin{bmatrix} 1 & 2 & 6 \end{bmatrix};
B = \text{diff}(A) = \begin{bmatrix} 1 & 4 \end{bmatrix}
\]

Example 3: A has just one column

\[
A = [1; 4];
B = \text{diff}(A);
\]

The first non-singleton dimension is 1

\[
A = \begin{bmatrix} 1 \\ 4 \end{bmatrix};
B = \text{diff}(A) = 3
\]