GetKroneckerOfPauliString

```
SetDirectory @ NotebookDirectory[];
Import["../Link/QuESTlink.m"];
```

Doc

```
? GetKroneckerOfPauliString
```

Symbol

GetKroneckerOfPauliString[product, n] expands the given
    Pauli product into an explicit n–Pauli Kronecker form. The zero target in the
    given product corresponds to the rightmost Pauli in the Kronecker form.
GetKroneckerOfPauliString[string, n] returns a list of
    {kronecker, coefficient} pairs; one for each term in the given Pauli string.
GetKroneckerOfPauliString[string] infers the number of Paulis from the given string or product.
This function is useful for converting QuESTlink's Pauli strings
    (i.e. subscript index notation) into fixed–size structures for easy comparison.

Correctness

Product

```
GetKroneckerOfPauliString[X0]
GetKroneckerOfPauliString[Z0]
```

⊗X

⊗Z

```
GetKroneckerOfPauliString[X0 Y1 Z2 Id3]
```

Id⊗Z⊗Y⊗X

```
GetKroneckerOfPauliString[Z9]
```

Z⊗Id⊗Id⊗Id⊗Id⊗Id⊗Id⊗Id⊗Id⊗Id

```
GetKroneckerOfPauliString[X0 Y1 Z2 Id3, 10]
```

Id⊗Id⊗Id⊗Id⊗Id⊗Id⊗Id⊗Z⊗Y⊗X

```
str = X0 Y1 Z2 X3 Y4;

matr = KroneckerProduct @@ (PauliMatrix[# /. {Id → 0, X → 1, Y → 2, Z → 3}] & /@
      GetKroneckerOfPauliString[str]);

matr === Normal @ CalcPauliExpressionMatrix[str]
```

True

String

```
GetKroneckerOfPauliString[X0 Y1 Z2 Id3]
GetKroneckerOfPauliString[a X0 Y1 Z2 Id3]
```

Id ⊗ Z ⊗ Y ⊗ X

{{Id ⊗ Z ⊗ Y ⊗ X, a}}

```
GetKroneckerOfPauliString[a X0 Y1 Z2 Id3 + b c X4 + d e f Y0 + Z0 + X1 Z4]
```

{{X ⊗ Id ⊗ Id ⊗ Id ⊗ Id, b c}, {Id ⊗ Id ⊗ Id ⊗ Id ⊗ Y, d e f},
 {Id ⊗ Id ⊗ Id ⊗ Id ⊗ Z, 1}, {Id ⊗ Id ⊗ Z ⊗ Y ⊗ X, a}, {Z ⊗ Id ⊗ Id ⊗ X ⊗ Id, 1}}

Errors

```
GetKroneckerOfPauliString[X1 + a]
```

GetKroneckerOfPauliString: Invalid arguments. See ?GetKroneckerOfPauliString

$Failed

```
GetKroneckerOfPauliString[X1, 1]
```

GetKroneckerOfPauliString: The given Pauli string targeted a larger index qubit than the number of qubits specified.

$Failed

```
GetKroneckerOfPauliString[X0 + Y1, 1]
```

GetKroneckerOfPauliString: The given Pauli string targeted a larger index qubit than the number of qubits specified.

```
GetKroneckerOfPauliString[X0 + Y1, 0]
```

GetKroneckerOfPauliString: Invalid arguments. See ?GetKroneckerOfPauliString

$Failed

```
GetKroneckerOfPauliString[Y1 X1]
```

GetKroneckerOfPauliString: Invalid arguments. See ?GetKroneckerOfPauliString

$Failed

```
GetKroneckerOfPauliString[X₁ X₁]
```

GetKroneckerOfPauliString: Invalid arguments. See ?GetKroneckerOfPauliString

```
$Failed
```

```
GetKroneckerOfPauliString[]
```

GetKroneckerOfPauliString: Invalid arguments. See ?GetKroneckerOfPauliString

```
$Failed
```