

☐ — rpn

☐ — RPN Examples

Individual call

RPN := 4 Mem, Prg & Flags length

`rpn("RST", RPN) = [ 0 ]` $RPN = [\text{Stk Mem Flg Prg K}]$ `rpn("5", RPN) = [5 0]``rpn(3, RPN) = [ 3 5 0 ]``rpn("-", RPN) = [2 0]``rpn("LN", RPN) = [ 0.6931 0 ]``rpn("STO 03", RPN) = [0.6931 0]` $RPN_{2 \ 3} = 0.6931$ `rpn(5, RPN) = [5 0.6931 0]``rpn("1/X", RPN) = [ 0.2 0.6931 0 ]``rpn("Y^X", RPN) = [0.9293 0]` $\sqrt[5]{\ln(2)} = 0.9293$ `rpn(6, RPN) = [6 0.9293 0]``rpn("!", RPN) = [ 720 0.9293 0 ]``rpn("1/X", RPN) = [0.0014 0.9293 0]``rpn("CHS", RPN) = [ -0.0014 0.9293 0 ]``rpn("+", RPN) = [0.9279 0]``rpn("RCL+03", RPN) = [ 1.6211 0.9279 0 ]``rpn(3, RPN) = [3 1.6211 0.9279 0]` $RPN_{3 \ 2} = 0$ `rpn(2, RPN) = [2 3 1.6211 0.9279 0]``rpn("SF 02", RPN) = [2 3 1.6211 0.9279 0]` $RPN_{3 \ 2} = 1$ `rpn("RDN", RPN) = [3 1.6211 0.9279 0 2]`

Grouped call Three ways

1. `rpn("RST", RPN) = [0]``rpn([ 2 "LN" "STO 03" 5 "NTHROOT" ], RPN) = [ 0.9293 0 ]``rpn([6 "!" "1/X" "CHS" "+" "RCL+03" 3 2 "SF 02" "RDN"], RPN) = [3 1.6211 0.9279 0 2]`

2.

RST
2
LN
STO 03
5
NTHROOT

 $a := 0$

6
!
1/X
CHS
+
RCL+03
3
2
SF 02
RDN

 $b := 0$ `rpn(description(a), RPN) = [0.9293 0]``rpn(description(b), RPN) = [3 1.6211 0.9279 0 2]`


```
rpn ([ "PRG 02" 20 "XEQ 01" "STO 02" 55 "END" ], A)=[ 10 20 0 ]
rpn ([ "CLS" 10 "XEQ 02" ], A)=[ 55 20 10 0 ]
rpn ([ "CLS" 30 "XEQ 02" ], A)=[ 55 20 30 0 ]
```

GTO

```
rpn ([ "PRG 03" 1 "FC? 01" "GTO 06" 4 "GTO 07" 6 7 "END" ], RPN)=[ 0 4 3 1 9 ]
rpn ([ "CLS" "CF 01" "XEQ 03" ], RPN)=[ 7 6 1 0 ]
rpn ([ "CLS" "SF 01" "XEQ 03" ], RPN)=[ 7 4 1 0 ]

rpn ([ "PRG 03" 1 "FC? 01" "GTO+03" 4 "GTO+02" 6 7 "END" ], RPN)=[ 7 4 1 0 ]
rpn ([ "CLS" "CF 01" "XEQ 03" ], RPN)=[ 7 6 1 0 ]
rpn ([ "CLS" "SF 01" "XEQ 03" ], RPN)=[ 7 4 1 0 ]
```

GSB

```
rpn ([ "PRG 04" 20 "X>Y?" "GSB 06" "+" "END" 55 "RET" ], RPN)=[ 7 4 1 0 ]
rpn ([ "CLS" 10 "XEQ 04" ], RPN)=[ 75 10 0 ]
rpn ([ "CLS" 30 "XEQ 04" ], RPN)=[ 50 0 ]

rpn ([ "PRG 04" 20 "X>Y?" "GSB+03" "+" "END" 55 "RET" ], RPN)=[ 50 0 ]
rpn ([ "CLS" 10 "XEQ 04" ], RPN)=[ 75 10 0 ]
rpn ([ "CLS" 30 "XEQ 04" ], RPN)=[ 50 0 ]
```

$$RPN = \left[\begin{array}{c} \left[\begin{array}{c} 50 \\ 0 \end{array} \right] \left[\begin{array}{c} 0 \\ 0 \\ 0.6931 \\ 0 \end{array} \right] \left[\begin{array}{c} 1 \\ 1 \\ 0 \\ 0 \end{array} \right] \left[\begin{array}{c} 0 \\ 0 \\ 0 \\ 0.6435 \end{array} \right] \left[\begin{array}{c} 0 \\ 0 \end{array} \right] \left[\begin{array}{c} \text{"PRG 03" 1 "FC? 01" "GTO+03" 4 "GTO+02" 6 7 "END"} \\ \text{"PRG 04" 20 "X>Y?" "GSB+03" "+" "END" 55 "RET"} \end{array} \right] \end{array} \right]$$

☐—rpn Calculus 1V Example

Calculus
Example

$$f(x) := \frac{x^3 + 5 \cdot x^2 - 3}{x^2 + 1}$$

$$\alpha := -4$$

$$f(-4) = 0.7647$$

Function

```
rpn ("RST", RPN)=[ 0 ]
```

```
rpn (description(f), RPN)=[ 0 ]
```

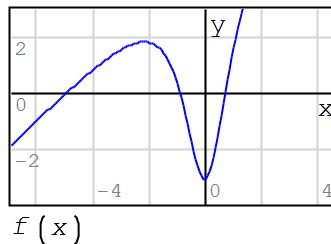
```
rpn ([ "CLS" α "STO 01" "XEQ 01" ], RPN)=[ 0.7647 -4 0 ]
```

Derivative

```
rpn (description(df), RPN)=[ 0.7647 -4 0 ]
```

$$\frac{d}{d\alpha} f(\alpha) = 0.8304$$

```
rpn ([ "CLS" α "STO 01" "XEQ 02" ], RPN)=[ 0.8304 -4 0 ]
```



```
PRG 02
XEQ 01
0.0000001
STO+01
X<>Y
XEQ 01
-
X<>Y
STO-01
/
CHS
END
```

df := 0

```
PRG 01
RCL 01
3
Y^X
RCL 01
2
Y^X
1
+
/
END
```

f := 0

```
PRG 03
RCL 01
XEQ 01
XEQ 02
/
RCL 01
-
CHS
STO 01
-
ABS
0.0000000001
X<Y?
GTO+05
CLX
CLX
RCL 01
END
CLX
CLX
GTO 01
```

nr := 0

Newton - Raphson

```
rpn (description (nr), RPN)=[ 0.8304 -4 0 ]  
rpn ([ "CLS" α "STO 01" "XEQ 03" ], RPN)=[ -4.8737 -4 0 ]
```

$$\left| \begin{array}{l} \text{while } 10^{-9} < \left| \alpha - \left(\beta := \alpha - \frac{f(\alpha)}{\frac{d}{d\alpha} f(\alpha)} \right) \right| \\ \alpha := \beta \\ \alpha \end{array} \right| = -4.8737$$

Sanity check:

$$f \left(\begin{smallmatrix} RPN \\ 1 \\ 1 \end{smallmatrix} \right) = 1.5501 \cdot 10^{-14}$$

Alvaro