

| VECTOR    | Vector menu     |       |                                        |                                      |                                          |                 |
|-----------|-----------------|-------|----------------------------------------|--------------------------------------|------------------------------------------|-----------------|
| g-shift   | →DEG            | →RAD  | →MUL $\pi$                             |                                      | $\vec{v}_2[10]$                          | $\vec{v}_2[01]$ |
| f-shift   | $\ \vec{x}\ _p$ | UNITV | $\ \vec{x}-\vec{y}\ _2$                | $\times \vec{x}, \vec{y}$            | dot                                      | cross           |
| unshifted | →R              | →P    | $\mathbb{C} \leftrightarrow \vec{v}_2$ | $y \times \leftrightarrow \vec{v}_2$ | $\vec{v} \leftarrow \rightarrow \vec{v}$ | DRG             |
| Page 2    | F1              | F2    | F3                                     | F4                                   | F5                                       | F6              |

Prev menu [https://47calc.com/doc/C47/Menus/C47\\_Menu\\_VECTOR\\_page\\_1.pdf](https://47calc.com/doc/C47/Menus/C47_Menu_VECTOR_page_1.pdf)

Next menu [https://47calc.com/doc/C47/Menus/C47\\_Menu\\_Volume\\_page\\_1.pdf](https://47calc.com/doc/C47/Menus/C47_Menu_Volume_page_1.pdf)

Ref 1 [https://47calc.com/doc/C47/Reference/C47\\_Vector\\_display.pdf](https://47calc.com/doc/C47/Reference/C47_Vector_display.pdf)

| Level      | Label              | Type                               | FullName                      | Extended description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Category                | Flag             | Catalog            | Default |
|------------|--------------------|------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------|--------------------|---------|
| Menu<br>p2 | VECTOR             | MENU                               | Vector menu                   | Vector functions ; Ref : <a href="https://47calc.com/doc/C47/Reference/C47_Vector_display.pdf">https://47calc.com/doc/C47/Reference/C47_Vector_display.pdf</a> ; Info : Vectors are stored internally as rectangular and calculation results are presented in rectangular format ; to edit a vector, first put it in rectangular format ; vector TI's are shown for values in X only and a small font may be used ; vector TI's are minimised if the stack changes or [EXIT] is pressed (only ijk or rθk or pθφ is shown, without subscripts or brackets)                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Vector operations       |                  | VECTOR             |         |
| F1         | →R                 | Function (monadic, dyadic)         | To rectangular                | Transform polar to rectangular coordinates (dyadic, stack conventions according to flag RP <sub>HP</sub> SET or CLEAR) ; transform Complex number or 2D/3D vector to rectangular notation (monadic) and set RECT tag ; TI : x : Re = ; y : Im = (RECT) ; Info : in Program Entry Mode, flag RP <sub>HP</sub> determines whether →RECT <sub>HP</sub> or →RECT <sub>EX</sub> is stored ; vector display depends on flag 3Dxyz, for 2D rectangular vector : [i,j] [ v <sub>1</sub> v <sub>2</sub> ] ; 3D rectangular vector : [ijk] [ v <sub>1</sub> v <sub>2</sub> v <sub>3</sub> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Complex and coordinates | RP <sub>HP</sub> | →RECT              |         |
| F2         | →P                 | Function (monadic, dyadic)         | To polar                      | Transform rectangular to polar coordinates (dyadic, stack conventions according to flag RP <sub>HP</sub> SET or CLEAR) ; transform Complex number or 2D/3D vector to polar notation (monadic) and set POLAR tag ; TI : r = ; θ = (POLAR) ; Info : in Program Entry Mode, flag RP <sub>HP</sub> determines whether →POL <sub>HP</sub> or →POL <sub>EX</sub> is stored ; for a 3D vector in X, function →POLAR (→P) cycles through →SPH, then →CYL ; vector display depends on flag 3Dxyz, for 2D polar vector : [rθ <sub>i</sub> ] [ v <sub>1</sub> v <sub>2</sub> ] <sup>P</sup> ; 3D spherical vector : [pθ <sub>i</sub> φ <sub>k</sub> ] [ v <sub>1</sub> v <sub>2</sub> v <sub>3</sub> ] <sup>S</sup> ; 3D cylindrical vector : [rθ <sub>i</sub> k] [ v <sub>1</sub> v <sub>2</sub> v <sub>3</sub> ] <sup>C</sup>                                                                                                                                                                                                                  | Complex and coordinates | RP <sub>HP</sub> | →POLAR             |         |
| F3         | ℂ↔V <sub>2</sub>   | Function (monadic)                 | Complex to or from 1x2 vector | Convert Complex number to or from 1x2 vector ; Info : Display depends on flag 3Dxyz, for rectangular vector : [i,j] [ v <sub>1</sub> v <sub>2</sub> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vector operations       | 3Dxyz            | ℂ↔V <sub>2</sub>   |         |
| F4         | yx↔V <sub>2</sub>  | Function (dyadic, nonpgm)          | Compose/decompose 1x2 vector  | Compose/decompose 1x2 vector from/to Y, X ; tagged angles in the input will be recognized and the appropriate coordinate tag will be applied to the vector ; Info : Display depends on flag 3Dxyz, for rectangular vector : [i,j] [ v <sub>1</sub> v <sub>2</sub> ] ; rectangular elements : [i] = ; [j] = ; polar vector : [rθ <sub>i</sub> ] [ v <sub>1</sub> v <sub>2</sub> ] <sup>P</sup> ; polar elements : [r] = ; [θ <sub>i</sub> ] =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Vector operations       | 3Dxyz            | yx↔V <sub>2</sub>  |         |
| F5         | ↔↔↔                | MENU                               | Vector conversions            | Vector conversion functions ; Ref : <a href="https://47calc.com/doc/C47/Reference/C47_Vector_display.pdf">https://47calc.com/doc/C47/Reference/C47_Vector_display.pdf</a> ; Info : Vectors are stored internally as rectangular and calculation results are presented in rectangular format ; to edit a vector, first put it in rectangular format ; vector TI's are shown for values in X only and a small font may be used ; vector TI's are minimised if the stack changes or [EXIT] is pressed (only ijk or rθk or pθφ is shown, without subscripts or brackets)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Vector operations       |                  | ↔↔↔                |         |
| F6         | DRG                | Function (monadic, cyclic, nonpgm) | Degrees-radians-gradians      | Add ADM tag to untagged value in X, convert tagged value to degrees-radians-gradians (cyclic) ; Info : Setting tag for complex X also sets POLAR mode for X according to ADM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Angle conversions       |                  | DRG                |         |
| fF1        | x   <sub>p</sub>   | Function (monadic)                 | Norm                          | Norm of vector or matrix in X with parameter p (trailing input) = 0, 1, 2, ..., 9, ∞ : 0 : Number of non-zeros of vector or matrix in X :   x   <sub>0</sub> = Σ <sub>i</sub> I(a <sub>i</sub> ≠0), where I is the indicator function, 1 if true, 0 if false ; 1 : Maximum column sum of absolute element values of a matrix in X :   x   <sub>1</sub> = max <sub>j</sub> Σ <sub>i</sub>  a <sub>ij</sub>   ; 2 : Euclidean magnitude of a vector in X or Frobenius norm of a matrix in X :   x   <sub>2</sub> = √Σ <sub>i</sub> Σ <sub>j</sub>  a <sub>ij</sub>   <sup>2</sup> ; 3 :   x   <sub>3</sub> = √Σ <sub>i</sub> Σ <sub>j</sub>  a <sub>ij</sub>   <sup>3</sup> ; ... ; 9 :   x   <sub>9</sub> = √Σ <sub>i</sub> Σ <sub>j</sub>  a <sub>ij</sub>   <sup>9</sup> ; ∞ : Maximum row sum of absolute element values of a matrix in X :   x   <sub>∞</sub> = max <sub>i</sub> Σ <sub>j</sub>  a <sub>ij</sub>   ; TAM :   x   <sub>p</sub> _ TamNorm menu ; Info : parameter 0, 1, 2, ..., 9, ∞ (use [TamNorm.1] F2 to enter ∞) | Matrix operations       |                  | x   <sub>p</sub>   |         |
| fF2        | UNITV              | Command                            | Unit vector or matrix         | Unit vector or matrix for Real or Complex matrix or vector ; the result will have Euclidean magnitude 1 ; Info : UNITV also applies to Complex numbers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Complex numbers         |                  | UNITV              |         |
| fF3        | x-y   <sub>2</sub> | Function (dyadic)                  | Perpendicular distance        | Perpendicular distance between Real matrices or vectors ; Complex matrices or vectors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vector operations       | 3Dxyz            | x-y   <sub>2</sub> |         |
| fF4        | ∠x,y               | Function (dyadic)                  | Vector angle                  | Angle between the 2D or 3D vectors in X and Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Matrix operations       | 3Dxyz            | ∠x,y               |         |
| fF5        | dot                | Function (dyadic)                  | Dot product (·)               | Dot product of vectors in X and Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Complex numbers         |                  | DOT                |         |
| fF6        | cross              | Function (dyadic)                  | Cross product (×)             | Cross product of vectors in X and Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Complex numbers         |                  | CROSS              |         |

| Level | Label           | Type               | FullName                        | Extended description                                                                                                                                    | Category                    | Flag  | Catalog         | Default |
|-------|-----------------|--------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------|-----------------|---------|
| gF1   | →DEG            | Function (monadic) | Set DEG tag or convert to DEG   | If untagged, set tag to DEG (degrees) ; if tagged, convert X to DEG ; does not change Angular Display Mode ; Tag : °                                    | Angle tagging or conversion |       | →DEG            |         |
| gF2   | →RAD            | Function (monadic) | Set RAD tag or convert to RAD   | If untagged, set tag to RAD (radians) ; if tagged, convert X to RAD ; does not change Angular Display Mode ; Tag : °                                    | Angle tagging or conversion |       | →RAD            |         |
| gF3   | →MULπ           | Function (monadic) | Set MULπ tag or convert to MULπ | If untagged, set tag to MULπ (multiple of pi radians) ; if tagged, convert X to MULπ ; does not change Angular Display Mode ; Tag : π°                  | Angle tagging or conversion |       | →MULπ           |         |
| gF4   |                 |                    |                                 |                                                                                                                                                         |                             |       |                 |         |
| gF5   | $\vec{v}_2[10]$ | Command            | Unit vector [1 0]               | Create a new 2D unit vector with elements [1 0] ; Info : Display depends on flag 3Dxyz, for rectangular vector : [ij] [ v <sub>1</sub> v <sub>2</sub> ] | Vector operations           | 3Dxyz | $\vec{v}_2[10]$ |         |
| gF6   | $\vec{v}_2[01]$ | Command            | Unit vector [0 1]               | Create a new 2D unit vector with elements [0 1] ; Info : Display depends on flag 3Dxyz, for rectangular vector : [ij] [ v <sub>1</sub> v <sub>2</sub> ] | Vector operations           | 3Dxyz | $\vec{v}_2[01]$ |         |

| p2   | VECTOR                                        | Link                                                                                                                                          |
|------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| F1   | $\rightarrow R$                               |                                                                                                                                               |
| F2   | $\rightarrow P$                               |                                                                                                                                               |
| F3   | $\mathbb{C} \leftrightarrow \vec{v}_2$        |                                                                                                                                               |
| F4   | $y \times \leftrightarrow \vec{v}_2$          |                                                                                                                                               |
| F5   | $\vec{v} \leftrightarrow \rightarrow \vec{v}$ | <a href="https://47calc.com/doc/C47/Menus/C47_Menu_VectorConv_page_1.pdf">https://47calc.com/doc/C47/Menus/C47_Menu_VectorConv_page_1.pdf</a> |
| F6   | DRG                                           |                                                                                                                                               |
| f F1 | $\ x\ _p$                                     |                                                                                                                                               |
| f F2 | UNITV                                         |                                                                                                                                               |
| f F3 | $\ \vec{x} - \vec{y}\ _2$                     |                                                                                                                                               |
| f F4 | $\angle \vec{x}, \vec{y}$                     |                                                                                                                                               |
| f F5 | dot                                           |                                                                                                                                               |
| f F6 | cross                                         |                                                                                                                                               |
| g F1 | $\rightarrow \text{DEG}$                      |                                                                                                                                               |
| g F2 | $\rightarrow \text{RAD}$                      |                                                                                                                                               |
| g F3 | $\rightarrow \text{MUL}\pi$                   |                                                                                                                                               |
| g F4 |                                               |                                                                                                                                               |
| g F5 | $\vec{v}_2[10]$                               |                                                                                                                                               |
| g F6 | $\vec{v}_2[01]$                               |                                                                                                                                               |