# ADDITIONAL CAS FUNCTIONS

## Functions and graphs

**`two_points(x1,y1,x2,y2)`**

finds information of 2 points in a cartesian plane

$$\text{two\_points}(-2, 4, 2, 0)$$
$$\rightarrow \text{equation: y=}2 - x$$
$$\rightarrow \text{midpoint: } (0, 2)$$
$$\rightarrow \text{length: } 4\sqrt{2}$$

**`stationary(f,var)`**

finds the stationary points of a function

$$\text{stationary}(x^4 - 2x^2, x)$$
$$\rightarrow \begin{bmatrix} x & -1 & 0 & 1 \\ y & -1 & 0 & -1 \end{bmatrix}$$

**`stationary_dom(f,var,dom)`**

finds the stationary points of any function with a domain restriction

$$\text{stationary\_dom}(\sin(\frac{x+\pi}{2}), x, 0 \leq x \leq 2\pi)$$
$$\rightarrow \begin{bmatrix} x & 0 & 2\pi \\ y & 1 & -1 \end{bmatrix}$$

**`distance_fn(f,var,x1,y1)`**

finds the distance function from a function to a point

$$\text{distance\_fn}(x^2 - 1, x, 2, 0)$$
$$\rightarrow \sqrt{x^4 - x^2 - 4x + 5}$$

**`projectile(v,d,g)`**

finds the cartesian equation of the path of a projectile motion

$$\text{projectile}(5, \frac{\pi}{3}, -9.8)$$
$$\rightarrow \sqrt{3}x - \frac{98x^2}{125}$$

## Geometry

`circle_line(cx,cy,r,l)`

finds the areas of parts of a circle intersected by a line

$$\text{circle\_line}(2, 1, 3, 2x)$$
$$\rightarrow \text{sector1: } 9.96$$
$$\rightarrow \text{sector2: } 18.31$$
$$\rightarrow \text{segment1: } 6.36$$
$$\rightarrow \text{segment2: } 21.91$$
$$\rightarrow \text{triangle: } 3.6$$

## Complex numbers

`cis(x)`

find rectangular form of a polar complex number

$$\text{cis}(\frac{\pi}{6})$$
$$\rightarrow \frac{\sqrt{3}}{2} + \frac{1}{2}i$$

`to_polar(z)`

convert rectangular complex number to polar

$$\text{to\_polar}(5 + 5\sqrt{3}i)$$
$$\rightarrow 10\text{cis}(\frac{\pi}{3})$$

## Vectors

`mag(v)`

finds the magnitude of a vector

$$\text{mag}(\begin{bmatrix}3 & 4\end{bmatrix})$$
$$\rightarrow 5$$

`ang(v1,v2)`

finds the angle between 2 vectors

$$\text{ang}(\begin{bmatrix}1 & 0\end{bmatrix}, \begin{bmatrix}1 & \sqrt{3}\end{bmatrix})$$
$$\rightarrow \frac{\pi}{3}$$

`scalar_resolute(v1,v2)`

finds the scalar resolute of 2 vectors

$$\text{scalar\_resolute}(\begin{bmatrix}1 & 2\end{bmatrix}, \begin{bmatrix}3 & 4\end{bmatrix}) \rightarrow \frac{11}{5}$$

`vector_resolute(v1,v2)`

finds the vector resolute of 2 vectors

$$\text{vector\_resolute}(\begin{bmatrix}1 & 0\end{bmatrix}, \begin{bmatrix}2 & 1\end{bmatrix}) \rightarrow \begin{bmatrix}\frac{4}{5} & \frac{2}{5}\end{bmatrix}$$