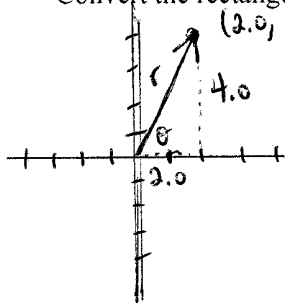


Physics: Class Examples
Mathematical Toolkit

Rectangular to Polar Coordinates

Example 5:

Convert the rectangular coordinates (2.0, 4.0) into polar coordinates (r, θ)



$$r^2 = 4^2 + 2^2$$

$$r^2 = 16 + 4$$

$$r^2 = 20$$

$$r = \sqrt{20}$$

$$r = 4.47$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

$$\theta = \tan^{-1}\left(\frac{4.0}{2.0}\right)$$

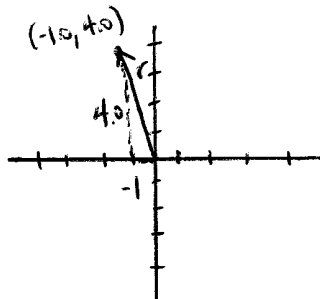
$$\theta = 63^\circ$$

QUAD I, No adjustment necessary

$$(2.0, 4.0) \rightarrow (4.5, 63^\circ)$$

Example 6:

Convert the rectangular coordinates (-1.00, 4.00) to polar coordinates (r, θ)



$$r^2 = (-1)^2 + (4)^2$$

$$r^2 = 1 + 16$$

$$r^2 = 17$$

$$r = \sqrt{17}$$

$$r = 4.12$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

$$\theta = \tan^{-1}\left(\frac{4.0}{-1.0}\right)$$

$$\theta = -75.96^\circ$$

QUAD II, so yes, adjustment necessary

$$\theta = \tan^{-1}\left(\frac{y}{x}\right) + 180$$

$$\theta = -75.96 + 180 = 104^\circ$$

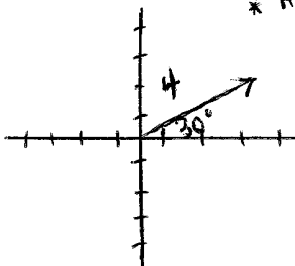
$$(-1.00, 4.00) \rightarrow (4.12, 104^\circ)$$

Converting Polar to Rectangular Coordinates

Example 7:

Convert the polar coordinates (4.00, 30.0°) to rectangular coordinates (x, y)

* Approximate sketch



$$r_x = \cos \theta \cdot r$$

$$r_x = \cos(30^\circ) \cdot 4.0$$

$$r_x = 3.46$$

$$r_y = \sin \theta \cdot r$$

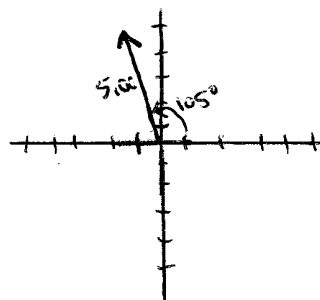
$$r_y = \sin(30^\circ) \cdot 4.0$$

$$r_y = 2.00$$

$$(4.00, 30.0^\circ) \rightarrow (3.46, 2.00)$$

Example 8:

Convert the polar coordinates (5.00, 105°) to rectangular coordinates (x, y)



$$r_x = \cos(105^\circ) \cdot 5.00$$

$$r_x = -1.29$$

$$r_y = \sin(105^\circ) \cdot 5.00$$

$$r_y = 4.83$$

$$(5.00, 105^\circ) \rightarrow (-1.29, 4.83)$$