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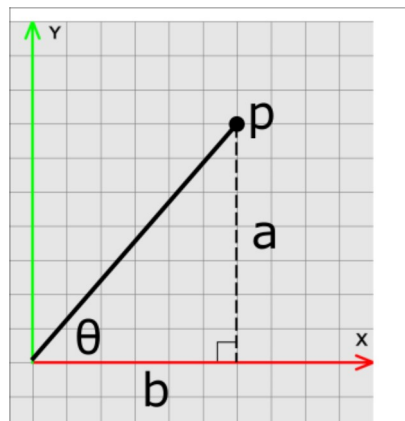
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Animation Pre-requisites: Self-assessment

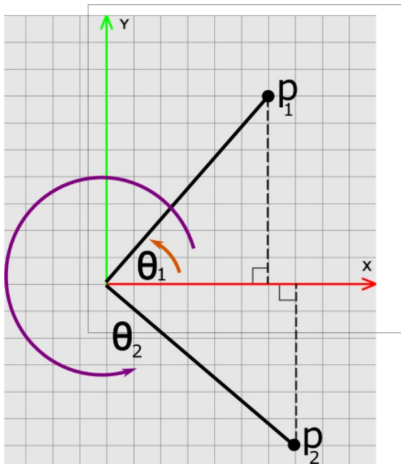
Use the questions below to identify topics for review.

Trigonometry

Consider the point p and angle θ below, where p is a distance of 1 unit from the origin and θ is 45 degrees. What is the coordinate of p ? Hint: what are the values of a and b ?



Consider the point p_1 and angle θ_1 below. Suppose $p_1 = (2, 2, 0)^T$. What is the value of θ_1 ? Hint: Use tangent.

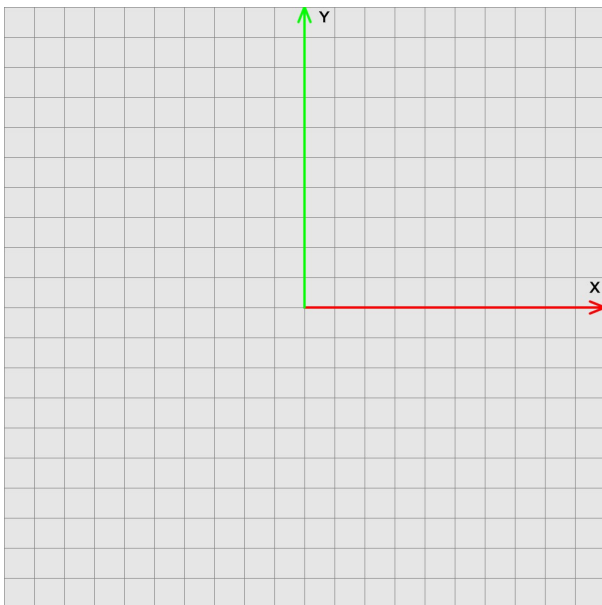


Consider the point p_2 and angle θ_2 above. Suppose $p_2 = (3, -2, 0)^T$. What is the value of θ_2 ?
Hint: Use tangent.

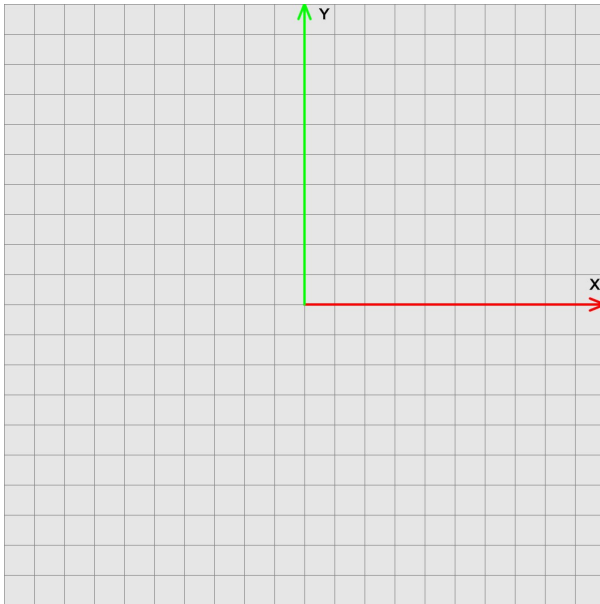
Vectors

A **vector** is an n -tuple of real numbers. In this class, we will work with 2D, 3D, and 4D vectors. Suppose we have a vector $u = (-2, 3, 0)^T$ and $v = (-1, 4, 0)^T$.

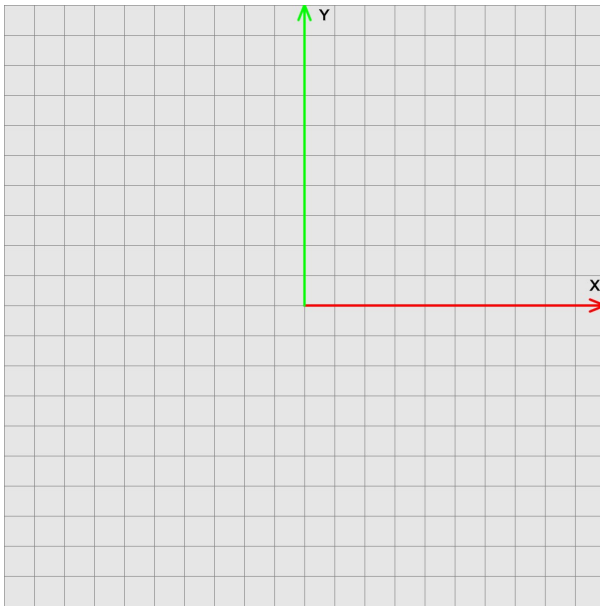
- Draw the vectors u and v , with their tails anchored at the origin below.



- What is the length of u ?
- What is the distance between u and v ?
- Compute and draw $u + v$.



- Compute and draw $u - v$



- Compute the cross product $u \times v$.
- Normalize the vector u , e.g. compute $\frac{u}{\|u\|}$.
- Compute the dot product $u \cdot v$.

Matrices

Consider the following matrices

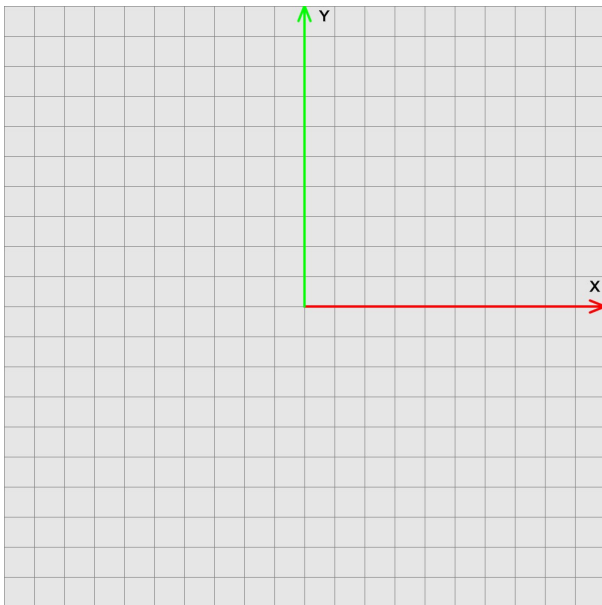
$$A = \begin{bmatrix} 1 & 3 \\ -0.5 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} -3 & 0 \\ 1 & 2 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 3 \\ -4 & 5 \\ 3 & -7 \end{bmatrix}$$

- What are the dimensions of A, B, and C?
- What is the transpose of the matrix C?
- Compute the products AB and BA.
- Is it possible to multiply C times itself? Why not? What about CC^T ?
- What is the product of AA^{-1} ?

Consider the following matrix

$$R = \begin{bmatrix} \cos(30) & \sin(30) & 0 \\ -\sin(30) & \cos(30) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- Suppose we have a vector $u = (1, 0, 0)^T$. Draw u below. Then multiply u by R and draw Ru .



Polynomials

Consider the polynomial $p(t) = 9t^3 + 6t^2$.

- What is the degree of $p(t)$?
- What is the derivative of $p(t)$?

- What is the value of $p(t)$ when $t = -1$?

Let $B_0(t) = (t - 1)^2$ and $B_1 = t - 2$.

- Compute an expression for $p(t) = B_0(t) + B_1(t)$ and re-arrange the terms into standard form



Standard form has the following pattern: $a_n t^n + \dots + a_2 t^2 + at + a_0$.

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