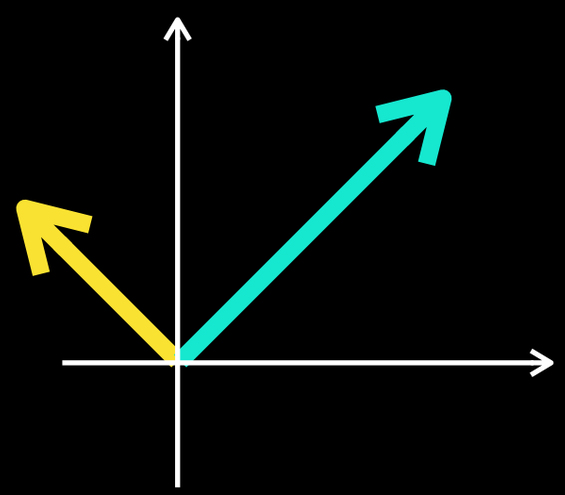
Example: Robot localization

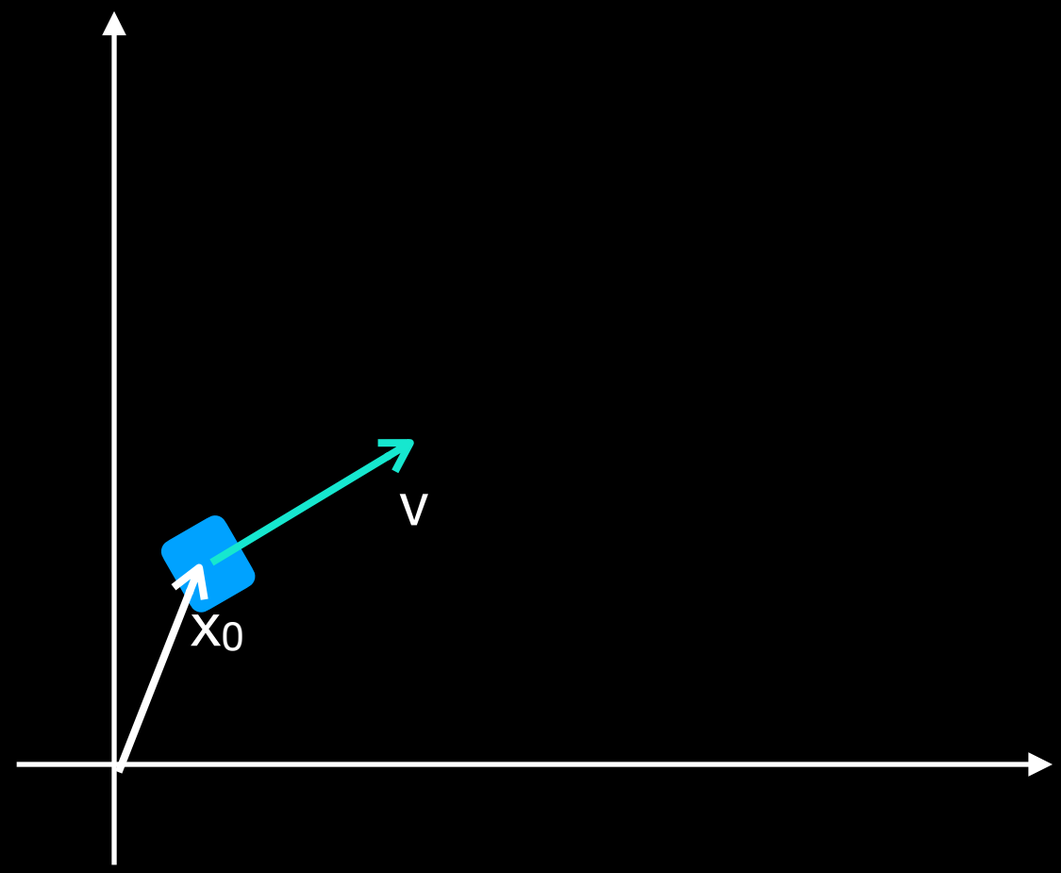
Linear Algebra Essentials



Given:
  initial position: $\mathbf{x_0}$
  initial velocity: $\mathbf{v}$

Robot changes its direction at t=0 on angle a_0, at t=1 on a_1, and so on

Find robot location at t=6, if the list of its turns is:
[15, 0, 20, 10, 25, -10]



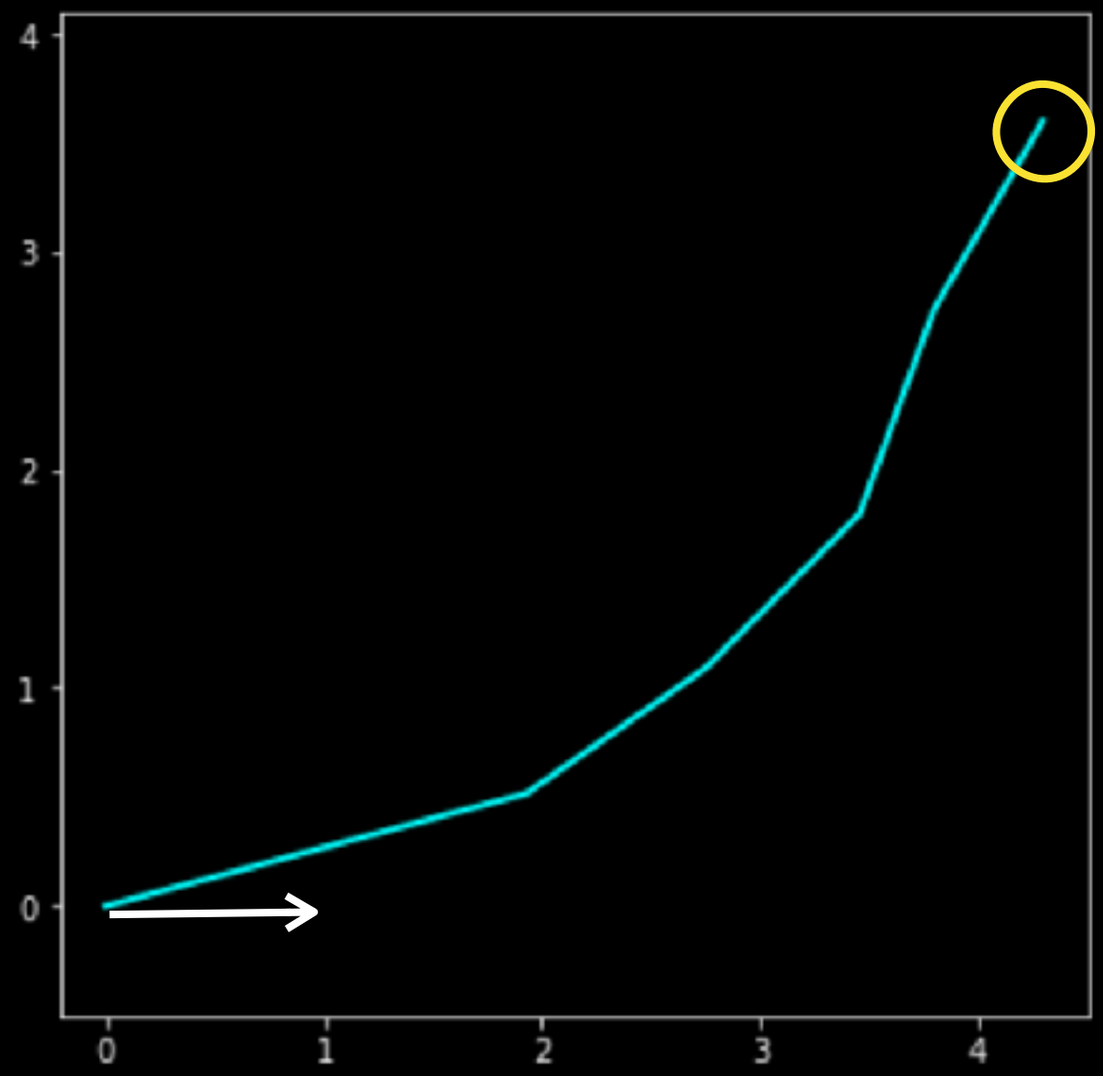
```python
X = [np.array([0, 0])]
v = np.array([1, 0])
angles = [15, 0, 20, 10, 25, -10]
```

```python
def rot(a):
    return np.array([[np.cos(a), -np.sin(a)],
                     [np.sin(a), np.cos(a)]])
```

```python
for a in angles:
    v = rot(np.radians(a)).dot(v)
    X.append( X[-1] + v )

X[-1]
```

```
array([4.30013062, 3.60403933])
```



$$v_n = R_{a_n} \cdot v_{n-1} \qquad R_a \text{ - rotation matrix on angle a}$$

$$x_{n+1} = x_n + v_n t = x_n + v_n$$