CSE 20 11-23-21

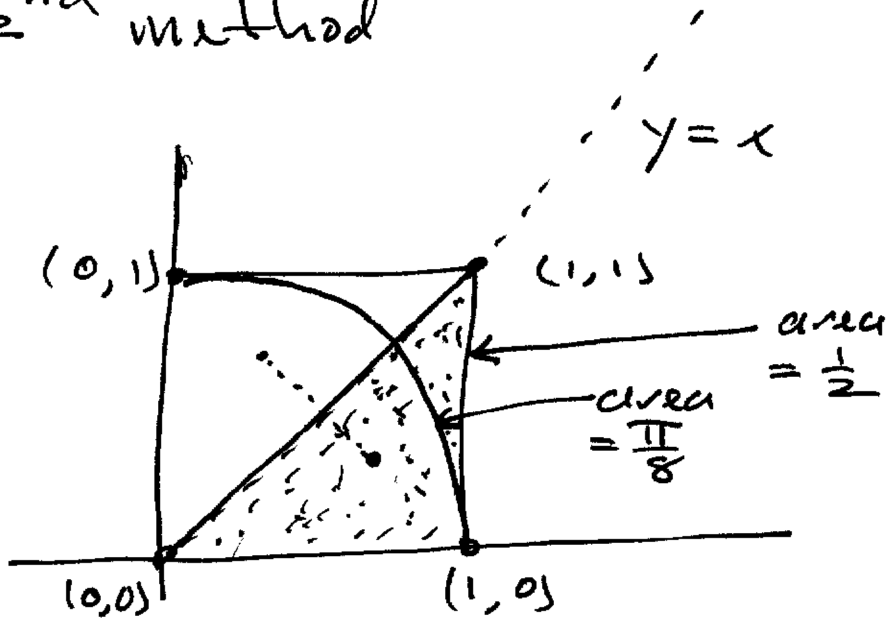
- quiz4: solns posted
- PA7: posted, ext. 2 days to Mon.
- office hrs: Wed. 10-12
  on campus, in person
- final exam: Mon 12-6-21
- quiz5: ~~Mon~~ Tue 11/30

- overriding a function:
  re-defining a function
- overloading a function:
  extending the defn of
  a fcn to new objects

continue ..

Ex. PointTest.py

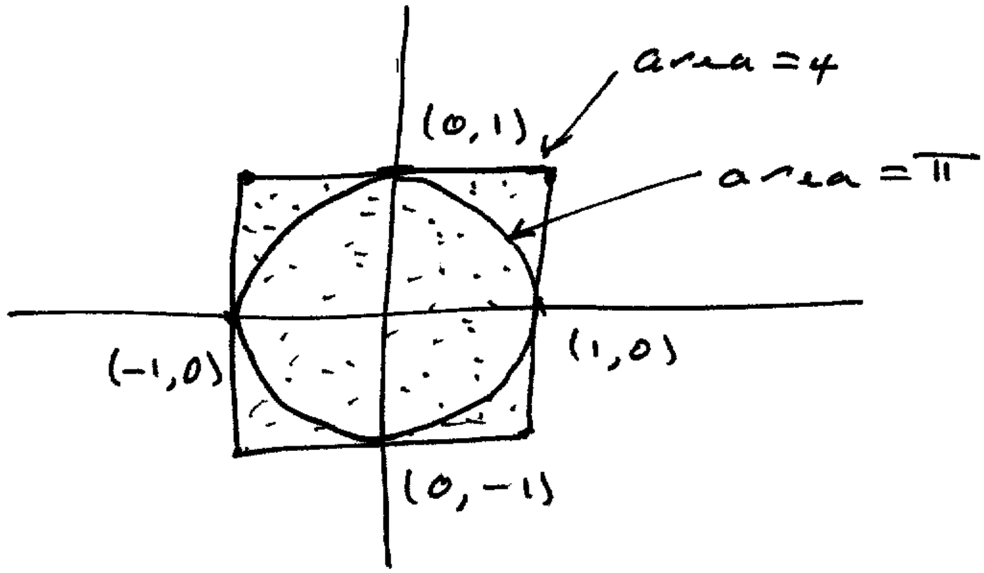
2nd method



$$\frac{\text{count}}{\text{total}} \approx \frac{\pi/8}{1/2} = \frac{\pi}{4}$$

$$\therefore \ \pi \approx 4\left(\frac{\text{count}}{\text{total}}\right)$$

3rd method



$$\frac{\text{count}}{\text{total}} \approx \frac{\pi}{4} \quad \therefore \quad \pi \approx 4\left(\frac{\text{count}}{\text{total}}\right)$$

<u>Ex.</u> vector.py

define Vector class

How can we represent a vector in 3-dim space ($\mathbb{R}^3$)?

$$v = (x, y, z) = xi + yj + zk \in \mathbb{R}^3$$

Possible ways:

- individual components as attributes.

  xcomp = x

  ycomp = y

  zcomp = z

- tuple (x, y, z)

  components = (x, y z)

- list [x, y, z]

  components = [x, y, z]

- dictionary { }

  components = {1: x, 2: y, 3: z}

we'll do this

vector operations

addition:

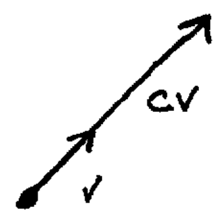
$$v + u = \langle v_1 + u_1,\ v_2 + u_2,\ v_3 + u_3 \rangle$$

subtraction

$$v - u = \langle v_1 - u_1,\ v_2 - u_2,\ v_3 - u_3 \rangle$$

scalar multiplication:

$$c \cdot v = \langle c v_1,\ c v_2,\ c v_3 \rangle$$



(hadamard) multiplication

$$v \cdot u = \langle v_1 \cdot u_1,\ v_2 \cdot u_2,\ v_3 \cdot u_3 \rangle$$

tensor product

$$v \otimes u = \begin{pmatrix} v_1 u_1 & v_1 u_2 & v_1 u_3 \\ v_2 u_1 & v_2 u_2 & v_2 u_3 \\ v_3 u_1 & v_3 u_2 & v_3 u_3 \end{pmatrix}$$

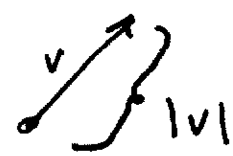
dot product

$$v \bullet u = v_1 \cdot u_1 + v_2 \cdot u_2 + v_3 \cdot u_3$$

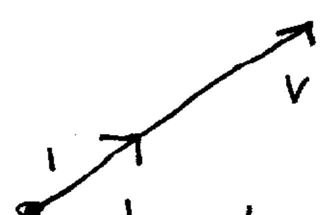
(geometric) length

$$\text{length}(v) = |v| = \sqrt{v_1^2 + v_2^2 + v_3^2}$$

$$= \sqrt{v \bullet v}$$

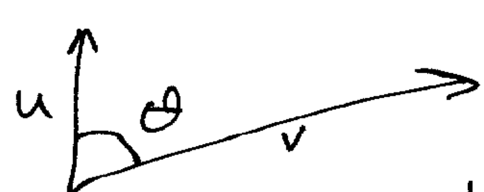


unit vector in direction of v:



$$\frac{1}{|v|} \cdot v = \frac{v}{|v|}$$

angle



$$\theta = \cos^{-1}\left(\frac{u \bullet v}{|u||v|}\right)$$