Bezout's Theorem - Extended Euclidean Algorithm

Arabic Animated intuition

Bezout's theorem

before learning about extended euclidean algorithm
we need to know bezout's theorem

we only know a and b what bezout say is that there is always
an integer x and an integer y that :

$$ax+by=gcd(a,b)$$

Extended Euclidean algorithm

$ax+by=gcd(a,b)$ (1)

we want find x and y and the gcd

from the Euclidean algorithm we know that

$gcd(a,b)= gcd(b,a\%b)$

$b\,x1+(a\%b)\,y1=gcd(a,b)$ (2)

$a\%b=a-b*floor(a/b)$

Ex: 10%3=1

1=10-3*floor(10/3)

$bx1+(a-b*floor(a/b))\,y1=gcd(a,b)$ (3)

$ay1+b(x1-floor(a/b)*y1)=gcd(a,b)$

the algorithm

is that in every iteration

x=y1

y=x1-floor(a/b)*y1

and my base case when b=0

x=1,y=0