class 08 Sectims M and R February 20 and 27 2024

1

We wrapped up last time by sketching the design of a downcounting exponentiation program, thinking that such a design might allow us to eliminate a parameter from expt-iter: if we start count at n and finish when count = 0, we no longer need the parameter n in expt-iter.

Recalling that a 'design idea', as we use the term in 335, consists in large part of a GI, we start today by giving a second development of a GI for this program.

Pant of the substantial about a GI? We need design idea what about a GI? We need a certain kind of relation which makes a connection between the program variables and the desired end result. Here - between count, result and br.

When The program stops, we want

when The program stants, we have court-n and we need to have a value for result which is 'easily' computed.

to start. Then Suppose rasult = N = 35 × LB2017 Sor, $b^n = b^{(NN)} \times resurt$ Then, on start we would have

Nave

The pount of the proof of th Moreover, when count=0, This equation Would give us

IN = b × result

onough

onough 1P, result = bh. The only thing left to chech is whether n wg decrement court — and so we not d adjust result to keep the equation true. Clemby if

I we have guess-code for an atternate Mas preu Lewored. define (expt-iter b count result) (MG ((56/0) cony) result) (else (expt-starb (- count 1) Nith This design compare and n. (* b result)

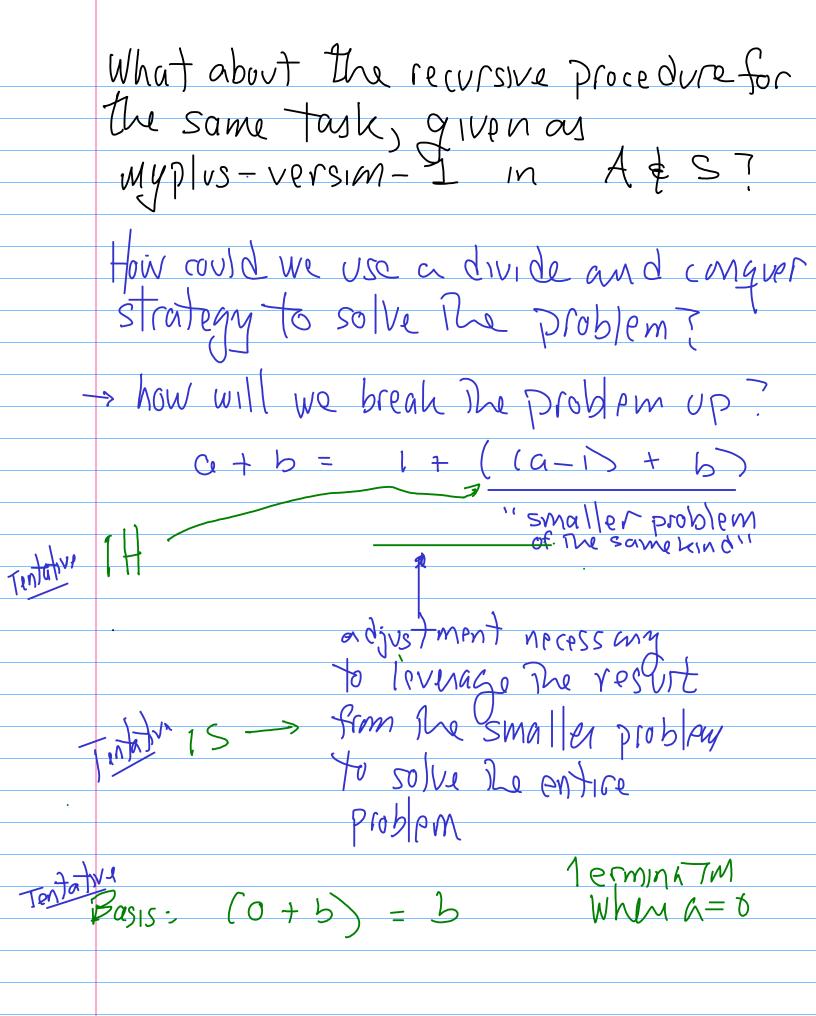
bn = bount x result

Then test ... and you're Ine Unless
The test Turns up problems.

2 .
Let's look now at an iterative program for adding two numbers a and b.
INO numbers a and b.
We'll assume a zo is an integer [butyou will certainly want to see about removing
will certainly want to see about removing
azo restrictim]
Design idea: addition has connected
Design idea: addition by repeated incrementation. We will start with
a and b, and (simultaneously)
decrement a and increment b until
O = O.
Sinco III decrement a at his simo
Since we decrement a at the same time as we increment b, a likely
<u>G1</u> 15;
a + b 15 constant
07/5/QN
Aconvenient way of referring to the initial values of a and b
a convenient way of referring to the
initial values of a and b

that we could write > strong enough? On termination, or plan is That a = 0. So The Egn mtial TWD)185 A+B=0+b=b and we could simply return b to got the desired sum. > Weak enough? On stant, a=A and b= B. So certainly A+B= a+b

$$\rightarrow$$
 preservable?
 $A+13=a+b$ \Rightarrow



It appears we can organize the construction and groof as an induction on a Reality check: 15 a something. which can be inducted ine (myade a b (Myab) Tatime of he