Pre-condition
- program code

Post-condition

if pre-cond. then post-cond

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Loops:

pre-cond

while (G){ //G is guard

//no break/continue

}

post-cond.

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compute $m \cdot x$ product $= m \cdot x$

Pre-cond: m is non-neg integer,
x is a real number,
and product = 0, and i = 0

while ($i \neq m$)

(1) product := product + x

(2) i := i + 1

and while

Post cond: product $= m \cdot x$

$[x + x + \cdots x]$ (m)

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Loop invariant: predicate over integers
I(k)

satisfies:

1) True prior to first iteration of loop
2) For each iteration
if it is true before iteration then it is true after
3) If the loop terminates in a finite # of steps
then the truth of I
ensures correctness of the loop.

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Given a loop w/ a guard G, pre/post cond. and an invariant I(n) show

I. Basis: pre-cond implies that I(0) is true

II. Inductive Property: for $k \geq 0$ $k \in \mathbb{Z}$
if $G \wedge I(k)$ then $I(k+1)$

III. Eventual falsity of the guard
in a finite # of steps, G is false

IV. Correctness of the post cond.
If N is the least number of iterations after which G is false and I(N) then
post cond. is true.

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Product Guard: $i \neq m$

I(n): $i = n$ and
product $= nx$

pre-cond: $m \in$ non-neg int
$x \in$ real
$i = 0$
product $= 0$

post-cond: product $= m \cdot x$

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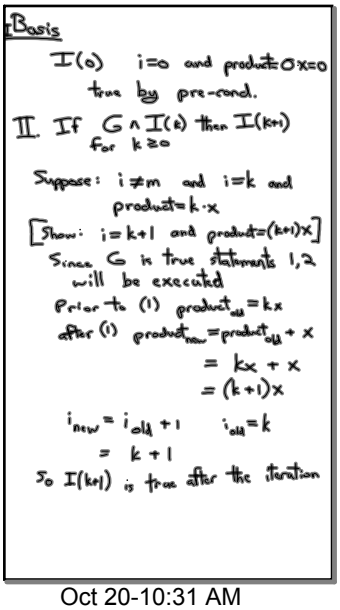

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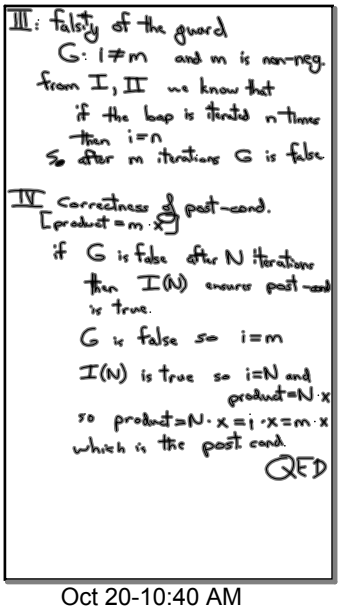

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