Strong induction

Basis: $P(a)$

Induction:

$[a \le i < k \;\; P(i)] \rightarrow P(k)$

$P(a) \wedge P(a+1) \wedge \cdots \wedge P(k-1) \rightarrow P(k)$

prove $P(n)$ $n \ge a$

Regular induction

Basis: $P(a)$

Induction: $P(k) \rightarrow P(k+1)$

assume $P(k)$

show $P(k+1)$

Conclusion

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$a|b \qquad b = a \cdot k \quad k \in \mathbb{Z}$

x is composite $\quad x = p \cdot q$ where

$p, q \neq 1$

$p, q \in \mathbb{Z}$

x is prime : not composite

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$\forall x, P(x) \rightarrow Q(x)$

negate:

$\sim(\forall x \sim P(x) \vee Q(x))$

$\exists x \sim(\sim P(x) \vee Q(x))$

$\exists x \;\; P(x) \wedge \sim Q(x)$

contrapositive:

$\forall x, \sim Q(x) \rightarrow \sim P(x)$

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Algorithms

correctness:

- compiles
- provides expected result
- if given correct input, it produces correct output.

P: input is correct

Q : output is correct

$P \rightarrow Q$

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Assertion: statement that is true when program is correct.

pre-conditions - assertions on parameters

post-conditions - assertions on return values

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