Given Every human is mortal 1. $\forall x$ human(x) $\longrightarrow$ mortal(x)

and Every mortal is alive 2. $\forall y$ mortal(y) $\rightarrow$ alive(y)

Formally Show Every human is alike $\forall z$ human(z) $\rightarrow$ alive(z)

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3. human(c) ded method premize
4. human(c) $\longrightarrow$ mortal(c) 1, ui
5. mortal(c) $\longrightarrow$ alive(c) 2, ui
6. mortal(c) 3, 4, mp

— ded. method proof

7. alive(c) 6, 5, mp
8. human(c) $\rightarrow$ alive(c) ded method 3–7
9. $\forall z$ human(z) $\rightarrow$ alive(z) 8, ug

Premise 1. $\forall x\, P(x) \rightarrow \forall y\, Q(x,y)$ premise

Show: $\forall x \forall y\, P(x) \rightarrow Q(x,y)$

2. $P(c) \rightarrow \forall y Q(c,y)$ 1, ui

3. $P(c)$ Ded method premise
4. $\forall y\, Q(c,y)$ 2, 3, mp

5. $Q(c,d)$ 4, ui
6. $P(c) \rightarrow Q(c,d)$ Ded method 3-5
7. $\forall y\, P(c) \rightarrow Q(c,y)$ 6 ug
8. $\forall x \forall y\, P(x) \rightarrow Q(x,y)$ 7 ug

Formal vs. (Informal) Proof

Deductive: proof that claims are entailed from our assumptions.

inductive reasoning ——— induction

Claim: $n(n-1)+41$ is always prime. (yes if you generalize from a lot of natural examples)

$\hookrightarrow n^2 - n + 41 = 41^2$ when $n = 41$ not prime.

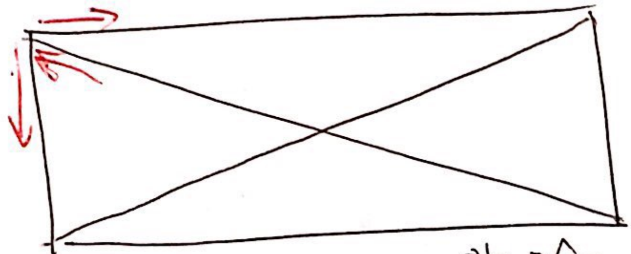
1.
2. all prime. But not entailed.
3.
4.
5.
6.

☆ Mathematical Induction is a deductive technique. ☆

Carl Witty

To prove or to refute?

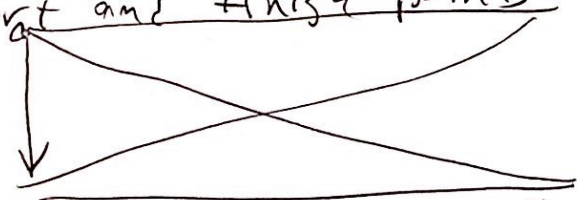
Claim: every odd natural number >2 is prime.



Trace in 1 line w/o retracing?

No, by exhaustive consideration (hard to do)

☆ a complete tracing uses an even # of segments at every intersection except possibly the start and finish points



$\Downarrow$

$\therefore$ traceable figures have at most 2 "odd intersections"