TYPE CHECKING

motivation:

approximate the set VAL* ∪ DIV/0* statically.

i.e., without simplifying the expression.

for such "well-typed" expressions,

no argument type checking is needed.

but is denominator = 0? (EFFICIENCY)
check is still needed.

a well-typed expression will not get stuck with an argument type mismatch during simplification.

(SAFETY).

TYPE SYSTEM

$$\frac{}{n \ \text{NUM}}\ \text{NUM}$$

$$\frac{}{b \ \text{BOOL}}\ \text{BOOL}$$

$$\frac{e_1 \ \text{NUM} \quad e_2 \ \text{NUM}}{e_1 \ (\text{op}) \ e_2 \ \text{NUM}}\ \text{OP}$$

$$\frac{e_1 \ \text{BOOL} \quad e_2 \ \tau \quad e_3 \ \tau}{(\text{if}) \ e_1 \ e_2 \ e_3 \ \tau}\ \text{IF}$$

$$\boxed{e \ \tau}$$

e is <u>well-typed</u> if

$$\vdash e \ \tau \quad \text{for some } \tau$$

otherwise, e is <u>ill typed</u>.

ex e = 2 / 0 + 5 NUM

① 0 NUM (CNUM)

② 2 NUM (CNUM)

③ 2 ① 0 NUM (OP)

④ 5 NUM (CNUM)

⑤ 2 / 0 + 5 NUM (OP)

e is well-typed

but gives a DIV/0 at runtime

ex e = if true 5 false → 5

but $\not\vdash_\omega e : \tau$ for any τ

e is ILL-TYPED,

but simplifies to a value, not an ATM?

∴ $\vdash_\omega$ is NOT complete. there exist e, st. $\not\vdash_\omega e$, but e VAL*.