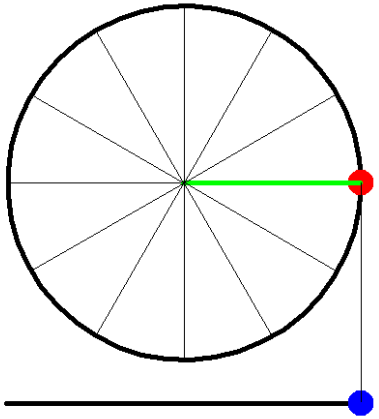
Physics Graph

Ben Payne

Derivation

"Given $\omega = 2\pi f$ and $T = \frac{1}{f}$, then $\omega = \frac{2\pi}{T}$."



What steps show this derivation?

Angular and linear frequency are related by
$\omega = 2\pi f$

Period and linear frequency are related by
$T = \frac{1}{f}$

Invert both sides of equation 2
$\frac{1}{T} = f$

Substitute equation 3 into equation 1
$\omega = \frac{2\pi}{T}$

Graph representation of Derivation

Statements are nodes on a graph

Angular and linear frequency are related by

$\omega = 2\pi f$

Period and linear frequency are related by

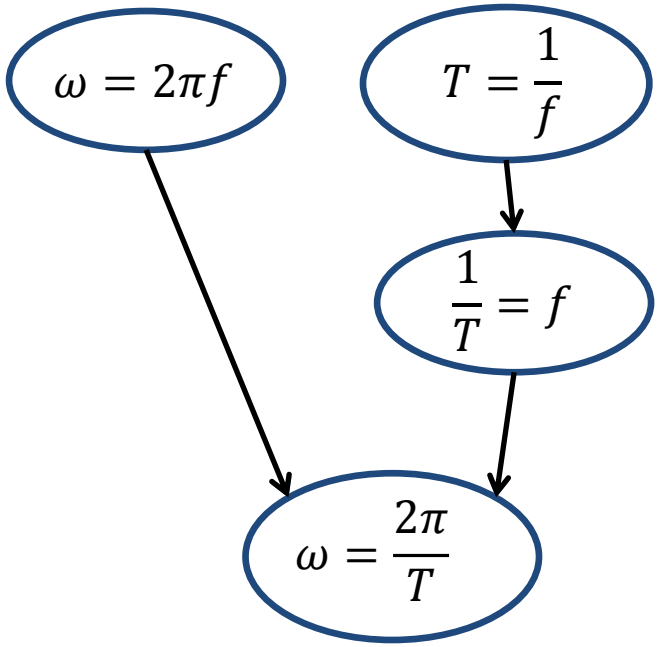
$T = \frac{1}{f}$

Invert both sides of equation 2

$\frac{1}{T} = f$

Substitute equation 3 into equation 1

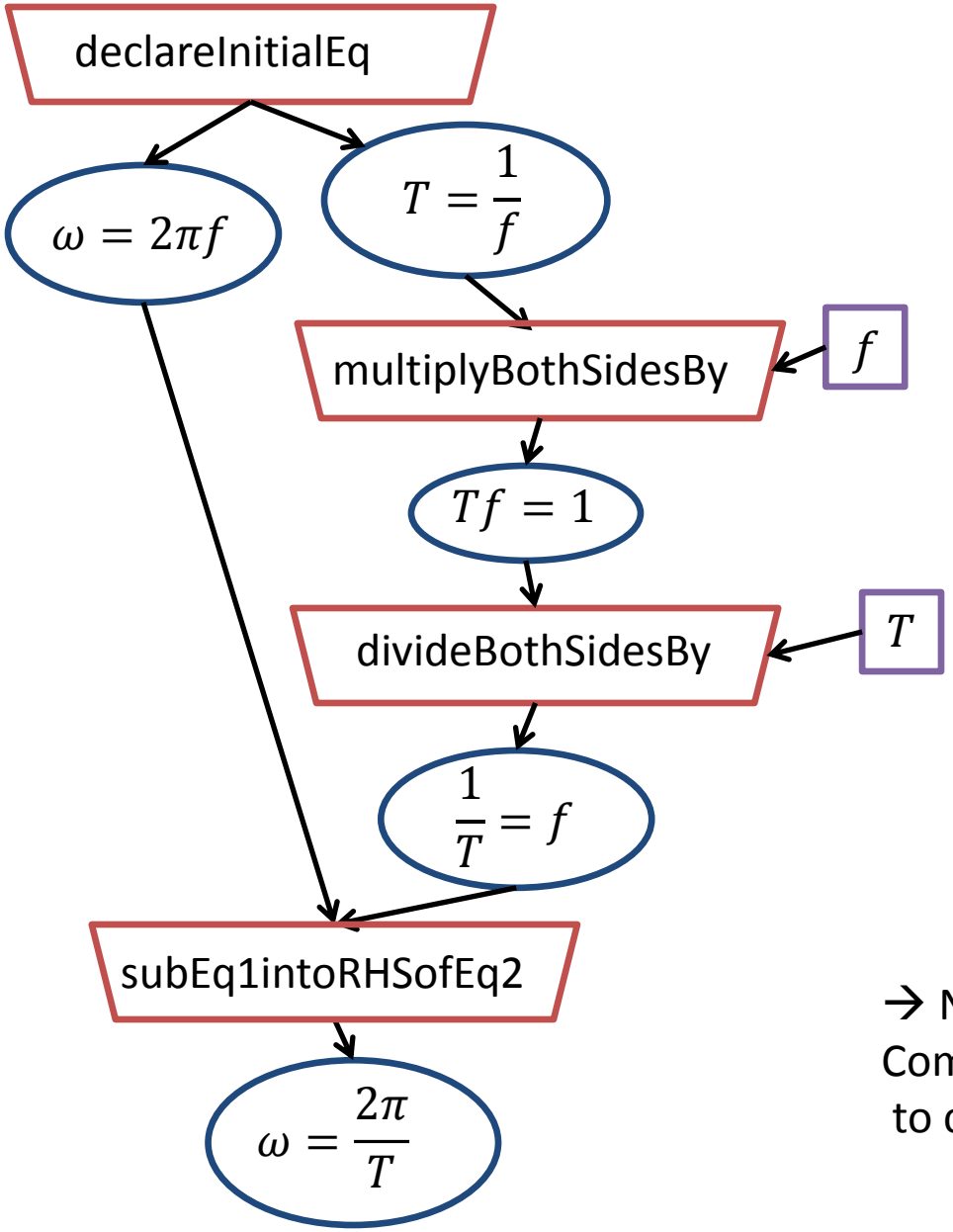
$\omega = \frac{2\pi}{T}$



Problem: Graph isn't helpful since the steps aren't atomic

→ Need a second type of node describing steps between statements

Derivation of frequency relations



- Inference rules:
- (True) propositions:

→ Now we can use a
Computer Algebra System
to check derivation (each inference rule)

Benefits and Costs

- Use graph as teaching aid
- Large number of work-hours to build graph, but it only needs to be done once

- Can we describe all of physics using a graph?
  - Standardized notation is needed
- How many inference rules are there?
  - Caveat: Godel's incompleteness theorem
- Has a project of this scope been completed before?
  - Donald Knuth's Tex for type-setting