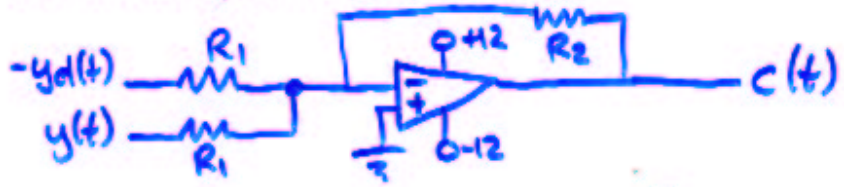
ARE REAL SYSTEMS LINEAR?

- We have assumed linear models, but almost all systems are non-linear
- Linear models often put us in the "ball park" of a good design. Then must use more complicated techniques to deal with non-linear effects.
- Common limiting non-linearity: Actuator saturation
- Inputs to the plant may have linear response only over a range
- For example, in the lab we use



- We assume that $c(t) = +\frac{R_2}{R_1}(y_d(t) - y(t))$
- But $-12 \leq c(t) \leq 12$ because of the supply rails
- If $y_d(t) \sim 20\ V_{p\text{-}p}$ and K is large, you will see this happen!
- usually design to avoid this.

Another example:

- Control of a chemical reaction by controlling flow of reactant entering through a valve.
- System may be linear around the "valve half open" point
- But valve cannot be more than fully open
  cannot be more than fully closed.

Design techniques for such systems are part of the "art" of control design