Today

- Reminders:
    - Pre-lecture assignment for Thursday 12 pm
    - Week 1 assignment due Friday 11:59 pm.
- Office hours: Tues 11:30-1 and Fri 12-1
- Separating variables
- Modeling tank inflow/outflow scenarios
- Existence and uniqueness (not going to test on the theory but important to know for general understanding)

Limits at infinity

- If y(t) is a particular solution to

$$\frac{dy}{dt} - 3y = -e^t$$

- depending on C, how many different results are possible for

$$\lim_{t \to \infty} y(t) \text{ ?}$$

(A) 0

(B) 1

(C) 2

(D) 3 (E) Don't know.

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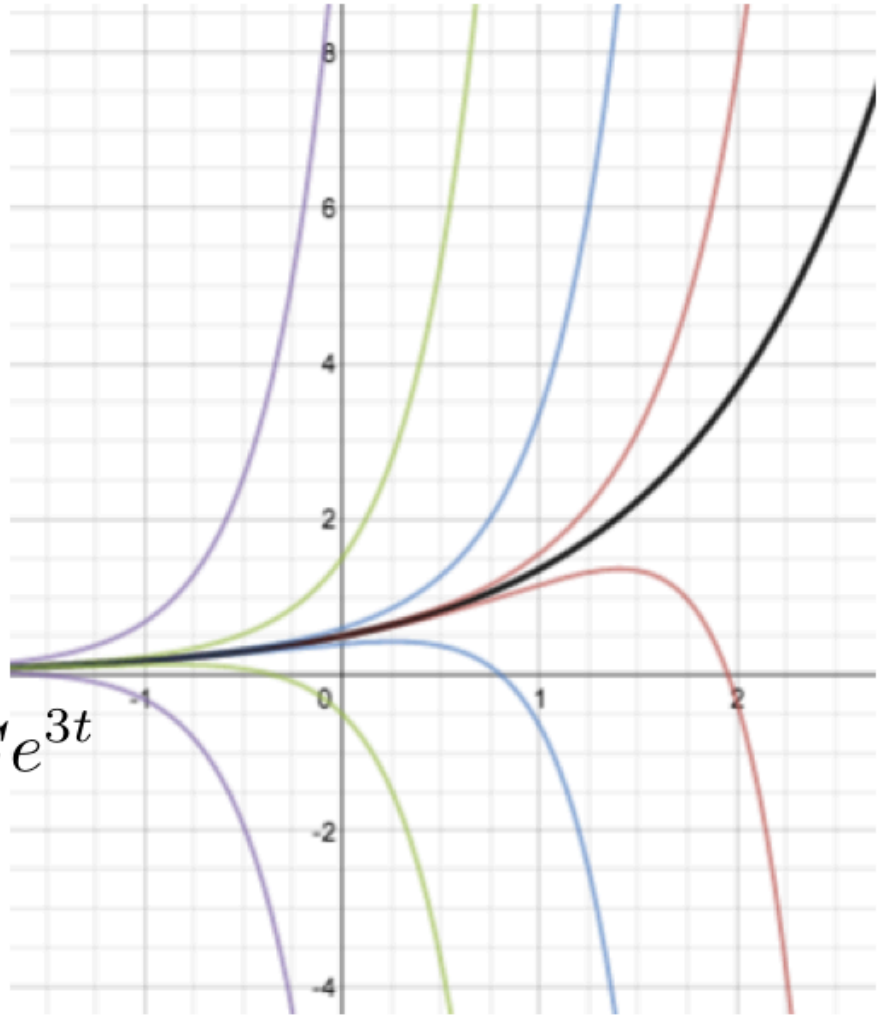

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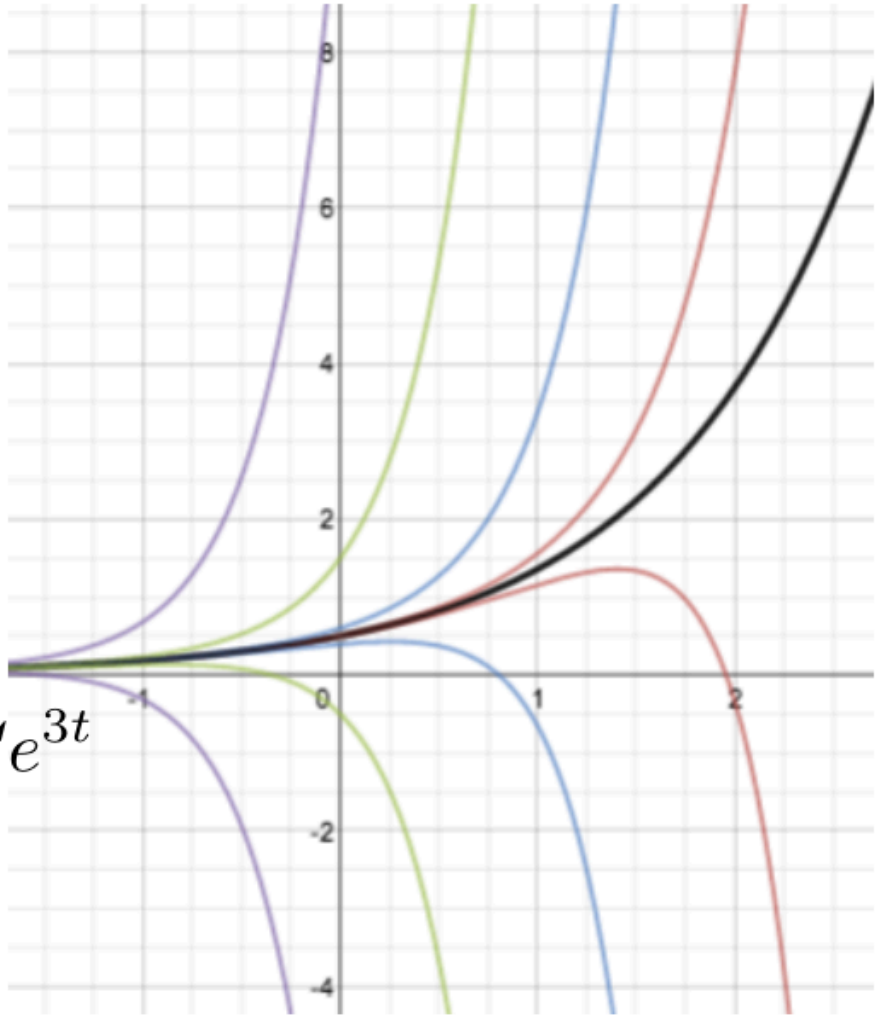

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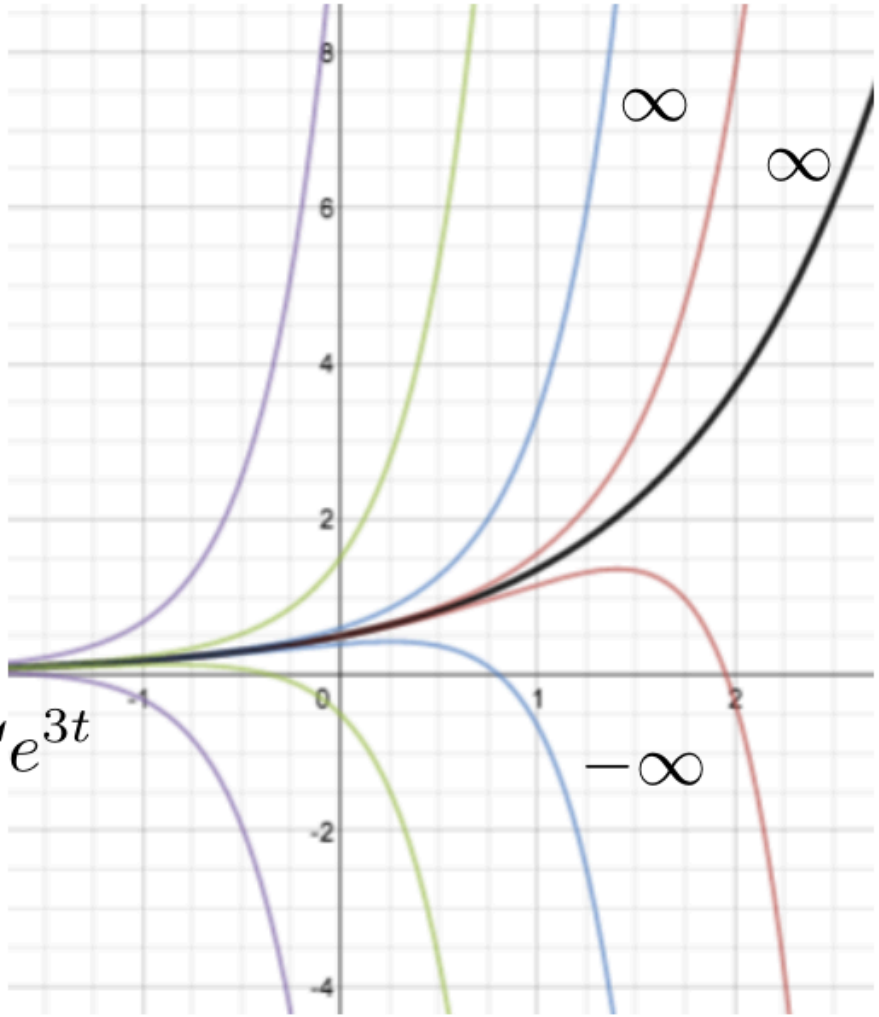

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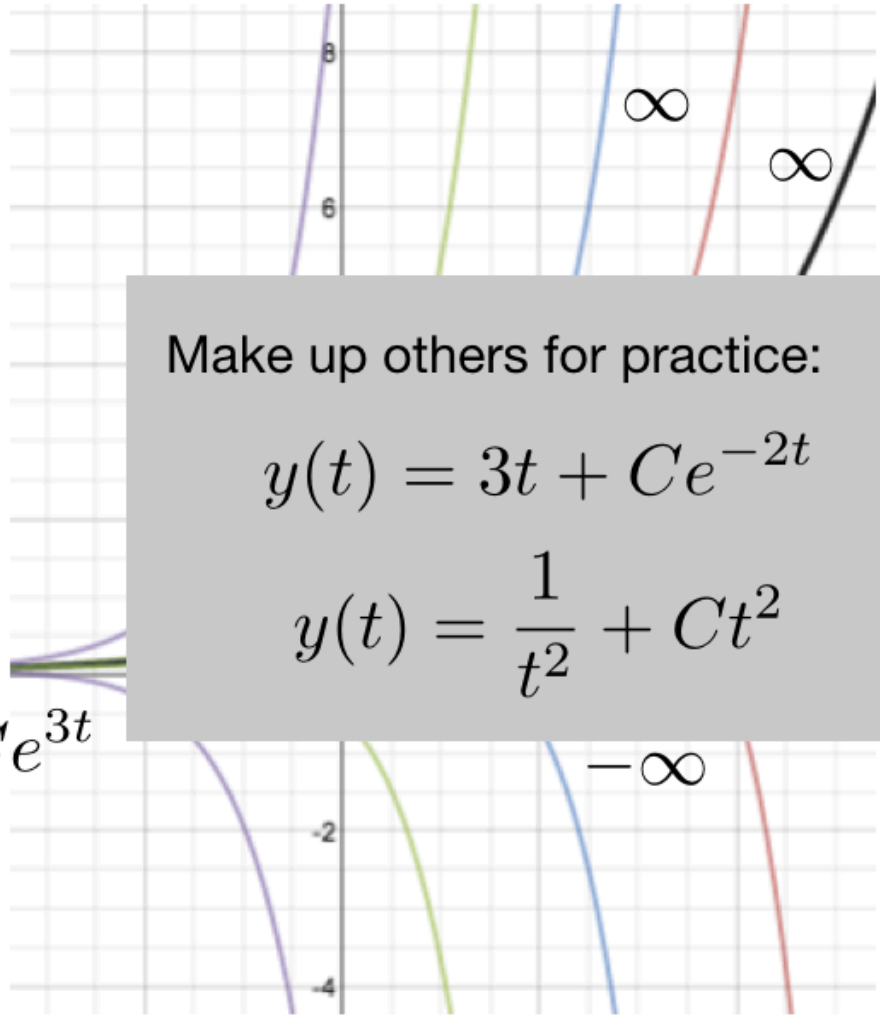

Make up others for practice:

$$y(t) = 3t + Ce^{-2t}$$

$$y(t) = \frac{1}{t^2} + Ct^2$$

Separable equations

- What is $\frac{d}{dt}e^y$?

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(B) $e^y \frac{dy}{dt}$

(C) ye^{y-1}

(D) $ye^{y-1}\frac{dy}{dt}$

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- Solve $\dfrac{dy}{dt} = e^{-y}t^2$.

(A) $y(t) = t^2e^t + C$

(B) $y(t) = \dfrac{1}{3}t^3 + C$

(C) $y(t) = \ln\left(\dfrac{1}{3}t^3\right) + C$

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Hint: rewrite as $e^y \dfrac{dy}{dt} = t^2$.

$$\frac{d}{dt}(e^y) = t^2$$

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