Bryan Ngo

Differentia Equations

RC Circuits

Transistor:

#### EECS 16B CSM

Bryan Ngo

Computer Science Mentors

2020-09-14

#### Who am I?

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Bryan Ng

Equations

RC Circuits

Transisto



- 2nd year majoring in EECS
- first time in CSM!
- took EECS 16B Spring 2020
- How I spent quarantine
  - lots of vidya (Hitman 2, Civ VI, Stellaris, etc.)
  - learned Haskell
  - building mechanical keyboard



### Who are you?

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- Name
- Pronouns
- Year/Major
- How you spent quarantine
- Most mundane/interesting fact about yourself

### Logistics

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- Join Piazza
- unexcused absences in first 3 weeks → auto-dropped & NP
- excused absences
  - email bryanngo@berkeley.edu & cc mentors@berkeley.edu with subject line [Request for Absence] <course>

### Expectations

Me to You

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rec circuit

- Be skeptical
- Constant feedback
- Become passionate about 16B

### Expectations

You to Me

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- Lecture:worksheet ratio?
- Get a webcam?
- Stop typing so loud?

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Differential Equations

# Differential Equations

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Differential Equations

Concept check!

## Differential Equations

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Concept check!

$$\frac{d}{dt}x(t) = f(x,t) \tag{1}$$

- Focusing on first-order ODEs
- Relates the derivative in other terms
- 3Blue1Brown video

# Exponential Differential Equation

Homogeneous

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$$\frac{d}{dt}x(t) = \lambda x(t) \implies x(t) = x_0 e^{\lambda t}$$
 (2)

## Exponential Differential Equation

Non-Homogeneous

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$$\frac{d}{dt}x(t) = \alpha x(t) + \beta \tag{3}$$

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## **RC Circuits**

## Undamped Response

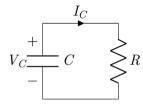
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## Undamped Response

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$$V_{C} \xrightarrow{+} C \xrightarrow{I_{C}} I$$

$$C\frac{d}{dt}V_C = -\frac{V_C}{R} \tag{4}$$

$$\frac{d}{dt} V_C = \underbrace{-\frac{1}{RC}}_{\lambda} V_C$$

$$\Rightarrow V_C(t) = V_0 e^{-\frac{1}{RC}t} = V_0 e^{-\frac{1}{\tau}t}$$
 (6)



(5)

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**Transistors** 

#### NMOS & PMOS

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