EECS 16B CSM

Bryan Ngo

Differential Equations

RC Circuits

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Bryan Ngo

Computer Science Mentors

2021-09-14



C Circuits

1 Differential Equations

Who am I?

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Differential Equations BC Circuits



- 3nd year majoring in EECS
- took EECS 16B Spring 2020
- Pertinent fact: was in Cory for 4 hours

Who are you?

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Differentia Equations

- Name
- Pronouns
- Year/Major
- Pertinent fact

Logistics

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- 2 unexcused absences during the semester
- excused absences: email bryanngo@berkeley.edu & cc mentors@berkeley.edu
 with subject line [Request for Absence] <course>
- Slides available at https://github.com/bdngo/16b-csm



Expectations

Me to You

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

Expectations

You to Me

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Differential Equations

Differential Equations

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Differential Equations

Equations

Concept check!

Differential Equations

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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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Differential Equations

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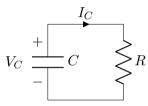
RC Circuits

Undamped Impulse Response

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Differential Equations



Undamped Impulse Response

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$$V_C \stackrel{+}{=} C \stackrel{I_C}{=} F$$

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

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

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

