Bryan Ngo

Differentia Equations

C Circuits

Change of Basis

EECS 16B CSM

Bryan Ngo

Computer Science Mentors

2022-02-08

RC Circuits

Change of

1 Differential Equations

2 RC Circuits

Who am I?

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Bryan Ngo

Equations

RC Circuit



- 3nd year majoring in EECS
- took EECS 16B Spring 2020
- Pertinent fact: watches too much AoT

Who are you?

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- Name
- Pronouns
- Year/Major
- Pertinent fact

Logistics

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Differentia Equations

RC Circuits

Change of

- 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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Differentia Equations

RC Circuits

CI CIICUIC

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

Expectations

You to Me

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Differentia Equations

RC Circui

Bryan Ngo

Differential Equations

PC Circuit

Change of

Differential Equations

Differential Equations

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Differential Equations

Circuit

. Circuit

Change of Basis Concept check!

Differential Equations

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Differential Equations

RC Circuits

Change of

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

RC Circuit

- Circuit

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

Exponential Differential Equation

Non-Homogeneous

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Differential Equations

RC Circuit

Change of

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

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Differentia Equations

RC Circuits

Change of Basis

RC Circuits

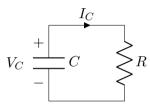
Undamped Impulse Response

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Differential Equations

RC Circuits



Undamped Impulse Response

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RC Circuits

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

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

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

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



(4)

(5)

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Differentia Equations

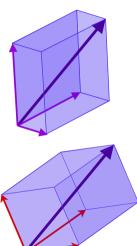
C Circuit

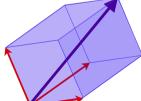
Change of Basis

Motivation

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- conversion from one linear coordinate system to another
- 3Blue1Brown video





A Visualization

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Differentia Equations

RC Circuit

