
EGR 103L – Fall 2016

L^AT_EX Assignment

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Lab Section 05, WEDNESDAY 11:45 AM - 2:35 PM
11 SEPTEMBER, 2016

I understand and have adhered to all the tenets of the Duke Community Standard in completing every part of this assignment. I understand that a violation of any part of the Standard on any part of this assignment can result in failure of this assignment, failure of this course, and/or suspension from Duke University.

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1 Equations

- General second-order system equation[1, p. 221]:

$$\frac{1}{\omega_n^2} \frac{d^2 x(t)}{dt^2} + \frac{2\zeta}{\omega_n} \frac{dx(t)}{dt} + x(t) = K_S f(t)$$

- The Secant Formula for finding maximum stress in a column[2, p. 681]:

$$\sigma_{\max} = \frac{P}{A} \left[1 + \frac{ec}{r^2} \sec \left(\frac{L}{2r} \sqrt{\frac{P}{EA}} \right) \right]$$

- Characteristic determinant for a 2x2 system of differential equations[3, p. 152]:

$$\begin{aligned} \det(\mathbf{A} - \lambda \mathbf{I}) &= \begin{vmatrix} a_{11} - \lambda & a_{12} \\ a_{21} & a_{22} - \lambda \end{vmatrix} \\ &= (a_{11} - \lambda)(a_{22} - \lambda) - a_{12}a_{21} \\ &= \lambda^2 - (a_{11} + a_{22})\lambda + a_{11}a_{22} - a_{12}a_{21} = 0 \end{aligned} \quad (1)$$

- Definition of the Lyapunov exponent[4, p. 56]:

$$h = \lim_{T \rightarrow \infty} \frac{1}{T} \ln \left| \frac{dx_T}{dx_0} \right| \quad (2)$$

$$h = \lim_{T \rightarrow \infty} \frac{1}{T} \sum_{n=0}^{T-1} \ln |M'(x_n)| \quad (3)$$

$$h = \int \ln |M'(x)| d\mu(x) \quad (4)$$

2 Tables using tabular and array

2.1 Using tabular

Converting ammonia into nitric acid - the Ostwald Process[5]:

Descripton	Chemical equation
Oxidation of Ammonia	$4 \text{ NH}_3 \text{ (g)} + 5 \text{ O}_2 \rightarrow 4 \text{ NO (g)} + 6 \text{ H}_2\text{O (g)}$
Oxidization of Nitric Oxide	$2 \text{ NO (g)} + \text{O}_2 \text{ (g)} \rightarrow 2 \text{ NO}_2 \text{ (g)}$
Absorption of Nitrogen Dioxide	$3 \text{ NO}_2 \text{ (g)} + \text{H}_2\text{O (l)} \rightarrow 2 \text{ HNO}_3 \text{ (aq)} + \text{NO (g)}$

2.2 Using array

Equation	Description
$\vec{v} = v_x \hat{i} + v_y \hat{j} + v_z \hat{k}$	Resolution into Components
$v^2 = v_0^2 + 2a\Delta x$	Velocity formula

3 Comments

Things I learned in this assignment:

- How to use the `align` and `align*` environment to typeset numbered and unnumbered equations and using the `nonumber` command to suppress numbering equations in an `align` environment;
- How to use `$` to enter math mode in a line of text to type shorter mathematical expressions like 10^6 and ∇u or Greek letters like Δ ;
- How to use the `\mathrm` command to put super- and subscripts in regular, versus italic, type for things like V_{\min} instead of V_{min} ;
- How to change the appearance of fonts to make words **bold**, *italics*, or **typewriter font**;
- How to write mathematical formulas with commands like `\frac`, `\sqrt`, etc;
- How to use `\item` command to write in an organized way with bullet points;
- How to use `&` command before equals sign to properly arrange following equations in mathematical formulas.

A Codes

A.1 Listing of full sample header for original code

```
1 % [Function or Script Name]
2 % [Your Name]
3 % [Date Modified]
4
5 % I understand and have adhered to all the tenets of the
6 % Duke Community Standard in creating this code. I understand
7 % that a violation of any part of the Standard on any part of
8 % this assignment can result in failure of this assignment,
9 % failure of this course, and/or suspension from Duke University.
10 % Signed: [Your NetID]
```

A.2 Listing of short sample header for original code

```
1 % [Function or Script Name]
2 % [Your Name]
3 % [Date Modified]
4
5 % I have adhered to all the tenets of the
6 % Duke Community Standard in creating this code.
7 % Signed: [Your NetID]
```

A.3 Listing of full sample header for modified code

```
1 % [Function or Script Name]
2 % [Your Name]
3 % [Date Modified]
4 % Based on: [Original Script or Function]
5 % Written by: [Original Author]
6
7 % I understand and have adhered to all the tenets of the
8 % Duke Community Standard in creating this code. I understand
9 % that a violation of any part of the Standard on any part of
10 % this assignment can result in failure of this assignment,
11 % failure of this course, and/or suspension from Duke University.
12 % Signed: [Your NetID]
```

A.4 Listing of short sample header for modified code

```
1 % [Function or Script Name]
2 % [Your Name]
3 % [Date Modified]
4 % Based on: [Original Script or Function]
5 % Written by: [Original Author]
6
7 % I have adhered to all the tenets of the
8 % Duke Community Standard in creating this code.
9 % Signed: [Your NetID]
```

B Figures

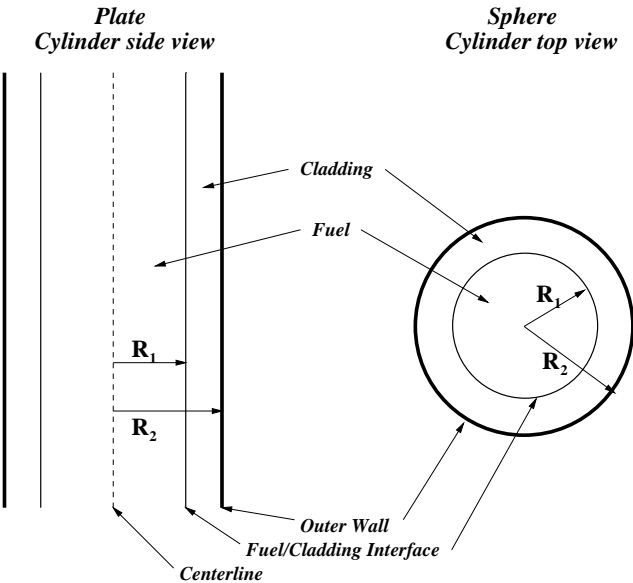


Figure 1: Drawing from ME 431L test.

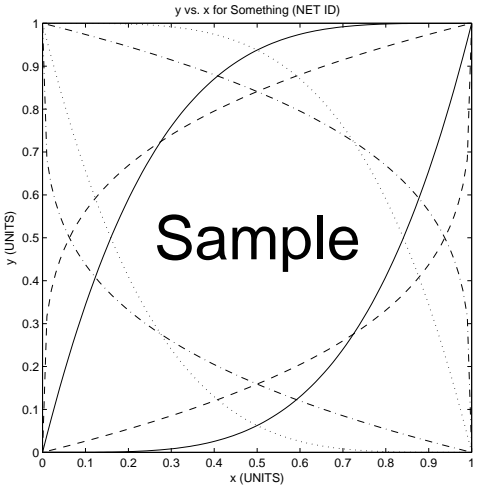


Figure 2: Sample MATLAB figure.

References

- [1] Rizzoni, Giorgio, *Principles and Applications of Electrical Engineering*. McGraw-Hill, New York, 5th Edition, 2007.
- [2] Hibbeler, R. C., *Mechanics of Materials*. Pearson Prentice Hall, Upper Saddle River, NJ, 8th Edition, 2011.
- [3] Kreyszig, Erwin, *Advanced Engineering Mathematics*. John Wiley & Sons, New York, 8th Edition, 1999.
- [4] Ott, Edward, *Chaos in Dynamical Systems*. Cambridge University Press, Cambridge, UK, 1st Edition, 1993.
- [5] Wikipedia, *Ostwald process* (http://en.wikipedia.org/wiki/Ostwald_process). Online; accessed 19-Aug-2012.