**EGR 103L – Fall 2017**

# LaTeX Assignment

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Lab Section 001, Tuesday 8:30-11:20 AM
September 10th, 2017

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.

## Contents



## List of Figures

# 1 Equations

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

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

- 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]:

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

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

$$h = \lim_{T\to\infty}\frac{1}{T}\ln\left|\frac{\mathrm{d}x_T}{\mathrm{d}x_0}\right| \tag{2}$$

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

$$h = \int \ln|M'(x)|d\mu(x) \tag{4}$$

# 2 Tables using `tabular` and `array`

## 2.1 Using `tabular`

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

| Description | Chemical equation |
|---|---|
| Oxidization of Ammonia | $4\ NH_3\ (g) + 5\ O_2(g) \rightarrow 4\ NO\ (g) + 6\ H_2O\ (g)$ |
| Oxidization of Nitric Oxide | $2\ NO\ (g) +\ O_2\ (g) \rightarrow 2\ NO_2\ (g)$ |
| Absorption of Nitrogen Dioxide | $3\ NO_2\ (g) + H_2O\ (l) \rightarrow 2\ HNO_3\ (aq) + NO\ (g)$ |

## 2.2 Using `array`

| Equation | Description |
|---|---|
| $\vec{v} = v_x\hat{\imath} + v_y\hat{\jmath} + v_z\hat{k}$ | 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 $\nabla u$ or Greek letters like $\Delta$;
- How to use the `mathrm` command to put super- and subscripts in regular, versus italic, type for things like $V_{\mathrm{min}}$ instead of $V_{min}$;
- How to change the appearance of fonts to make words **bold**, *italics*, underlined, or `typewriter font`;
- How to use the `tabular` environment to create tables of varying sizes and formats;
- How to use the `array` environment to create arrays; and
- How to adjust font size with commands such as `Bigg` and `small`.

# A Codes

## A.1 Listing of full sample header for original code

```
% [Function or Script Name]
% [Your Name]
% [Date Modified]

% I understand and have adhered to all the tenets of the
% Duke Community Standard in creating this code.  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.
% Signed: [Your NetID]
```

## A.2 Listing of short sample header for original code

```
% [Function or Script Name]
% [Your Name]
% [Date Modified]

% I have adhered to all the tenets of the
% Duke Community Standard in creating this code.
% Signed: [Your NetID]
```

## A.3 Listing of full sample header for modified code

```
% [Function or Script Name]
% [Your Name]
% [Date Modified]
% Based on: [Original Script or Function]
% Written by: [Original Author]

% I understand and have adhered to all the tenets of the
% Duke Community Standard in creating this code.  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.
% Signed: [Your NetID]
```

## A.4 Listing of short sample header for modified code

```
% [Function or Script Name]
% [Your Name]
% [Date Modified]
% Based on: [Original Script or Function]
% Written by: [Original Author]

% I have adhered to all the tenets of the
% Duke Community Standard in creating this code.
% Signed: [Your NetID]
```

# B Figures

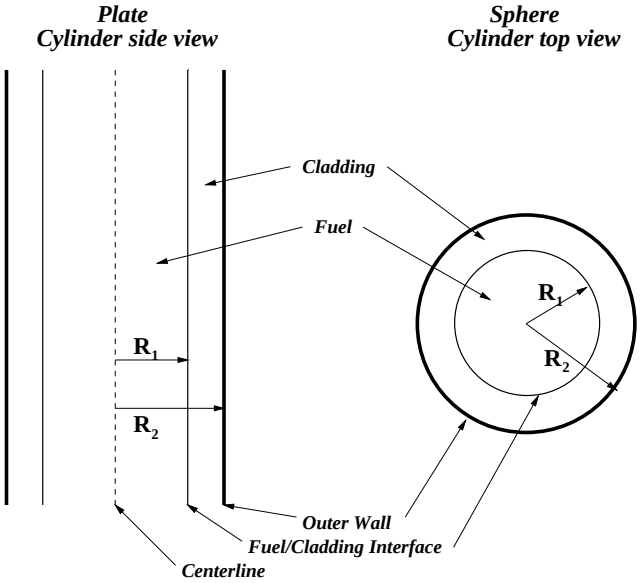


Figure 1: Drawing from ME 431L test.

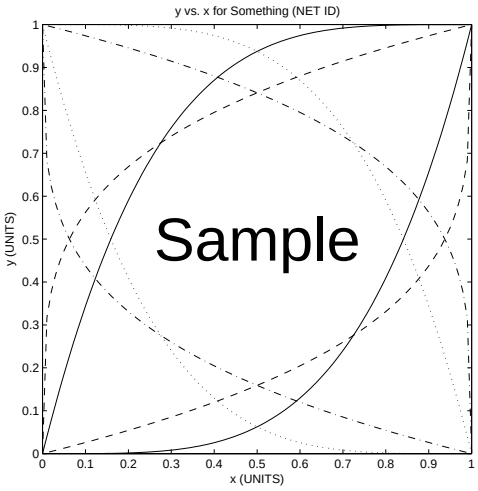


Figure 2: Sample MATLAB figure.

# References


[1] Rizzoni, Georgio, *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.