UNIVERSITY OF LEICESTER

MA1014
CALCULUS AND ANALYSIS
INTRODUCTION

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HELLO!

- Applied Mathematics PhD student at University of Leicester
- Background in Mathematics and Physics
- Work in Fluid Dynamics
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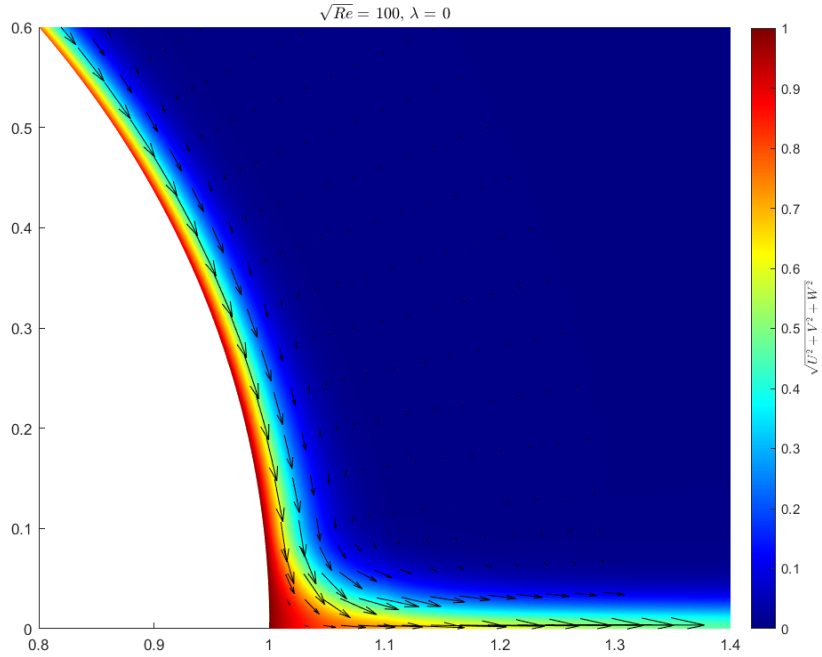
$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0$$

$$\rho\left[\frac{\partial u}{\partial t}+\frac{\partial u}{\partial x}u+\frac{\partial u}{\partial y}v+\frac{\partial u}{\partial z}w\right]=-\frac{\partial p}{\partial x}+\mu\left(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right)+\rho g_x$$

$$\rho\left[\frac{\partial v}{\partial t}+\frac{\partial v}{\partial x}u+\frac{\partial v}{\partial y}v+\frac{\partial v}{\partial z}w\right]=-\frac{\partial p}{\partial y}+\mu\left(\frac{\partial^2 v}{\partial x^2}+\frac{\partial^2 v}{\partial y^2}+\frac{\partial^2 v}{\partial z^2}\right)+\rho g_y$$

$$\rho\left[\frac{\partial w}{\partial t}+\frac{\partial w}{\partial x}u+\frac{\partial w}{\partial y}v+\frac{\partial w}{\partial z}w\right]=-\frac{\partial p}{\partial z}+\mu\left(\frac{\partial^2 w}{\partial x^2}+\frac{\partial^2 w}{\partial y^2}+\frac{\partial^2 w}{\partial z^2}\right)+\rho g_z$$



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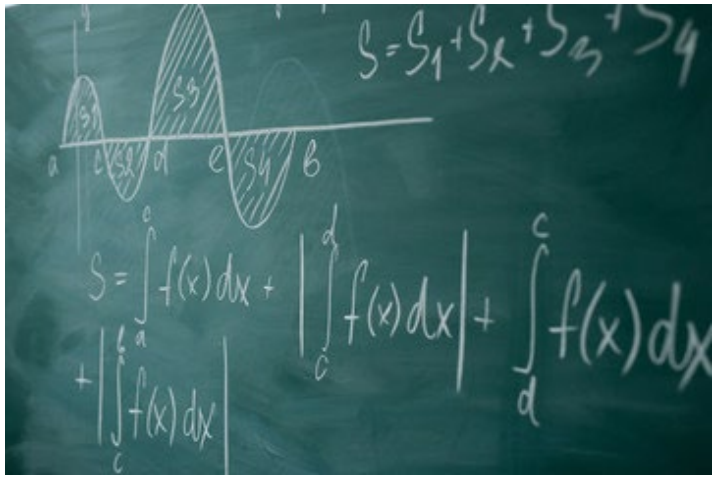
TUTORIALS



- These are for you!
- Problems
  - Split into small groups
  - Discuss solution/s
  - Present solution
- Ask Questions
  - Class Reps
  - Discussion Board
  - Email me and/or Andy

BLACKBOARD

Your course will be delivered through Blackboard

Each week you will receive instructions on the appropriate blackboard page on what videos to watch and what pages in the notes you should read.

There is a worksheet which you should work through, attempting **ALL** questions. The coursework questions will be a subset of these!

It is important to keep up to date on all content, so organisation is key!

ASSESSMENT

Coursework (20%):

- Groups of 5/6
- It is a good idea to form them ASAP and start working through the workbook
- Selection of exercises from the Workbook TBD
- 2 sets of questions per semester (5% each)

Class Test (30%):

- 2 hour test at the end of the first semester

Final Exam (50%):

- 2 hour exam at the end of the second semester

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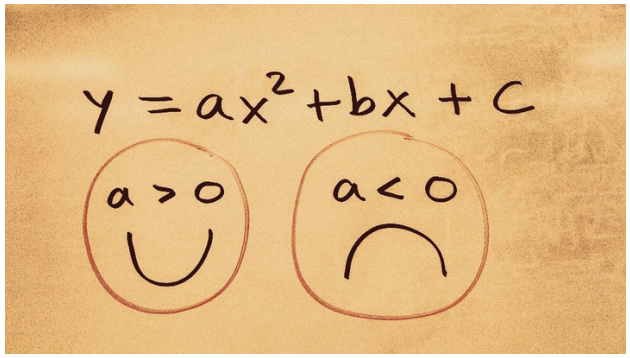


$$\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$$

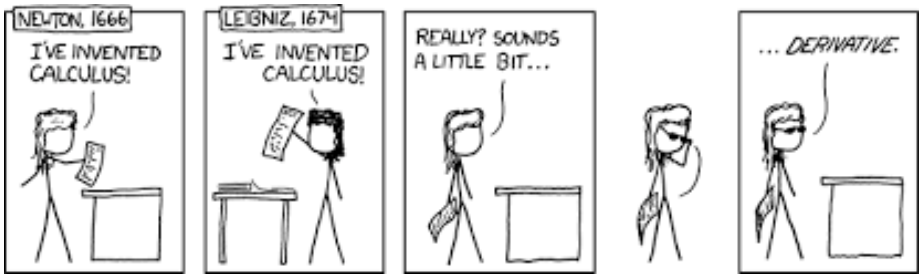
$$\int_a^b f(x)dx = F(b) - F(a)$$

L

ANY QUESTIONS?

$$m\frac{d^2x}{dt^2} = -kx$$

$$\int \frac{dx}{1+x^2} = \tan^{-1}(x) + C$$



ANNOUNCEMENTS

- No live tutorials next week ☹
- I will prepare some content for you to work through instead

NUMBER SYSTEMS

- Natural Numbers: $\mathbb{N} = \{0,1,2,3,4, \dots\}$ (maybe denoted $\mathbb{N}_0$)
- Integers: $\mathbb{Z} = \{\dots, -2, -1, 0, 1, 2, \dots\}$
- Rationals/Quotients: $\mathbb{Q} = \left\{x : x = \frac{p}{q};\ p, q \in \mathbb{Z},\ q \neq 0\right\}$
- Reals: $\mathbb{R} = \{x : x \text{ is rational or irrational}\}$
- Complex numbers: $\mathbb{C} = \left\{a + bi : a, b \in \mathbb{R},\ i = \sqrt{-1}\right\}$

EXERCISE: DETERMINE THE SMALLEST* SET EACH NUMBER BELONGS TO

a) 5

b) 0.334

c) $\frac{1}{3}$

d) $\sqrt{2}$

e) -3

f) π

g) -2.75

h) 0

i) e^{-1}

j) $\sqrt{-1}$

Number Systems:

- $\mathbb{N}$: Natural Numbers
- $\mathbb{Z}$: Integers
- $\mathbb{Q}$: Quotients/Rational Numbers
- $\mathbb{R}$: Real Numbers
- $\mathbb{C}$: Complex Numbers

*Obviously, the word small makes no sense when dealing with infinite sets!

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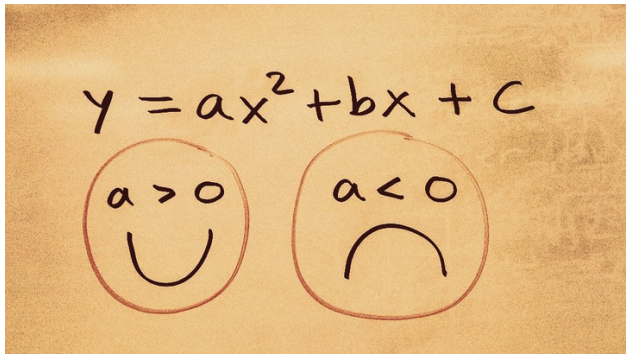

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