

STA 322 - Assignment

L^AT_EX Document

Francis Muti - I63/1176/2018

A L^AT_EX document to showcase scientific writing and use of mathematical symbols.



UNIVERSITY OF NAIROBI

School of Mathematics

University of Nairobi

May 15, 2021

1 Latex Exercise

1.1 Easy

Please type me! The quick brown fox jumps over the lazy dog (1)

$$e^{i\pi} + 1 = 0 \quad (2)$$

$$e^{i\theta} = \cos \theta + i \sin \theta \quad (3)$$

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu} \quad (4)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (5)$$

$$\vec{L} = \vec{r} \times \vec{p} \quad (6)$$

$$\sqrt[3]{2} \quad (7)$$

$$(x+y)^n = \sum_{r=0}^n \binom{n}{r} x^r y^{n-r} \quad (8)$$

$$\sqrt{\frac{a_1^2 + \dots + a_n^2}{n}} \geq \frac{a_1 + \dots + a_n}{n} \geq \sqrt[n]{a_1 \dots a_n} \geq \frac{n}{\frac{1}{a_1} + \dots + \frac{1}{a_n}} \quad (9)$$

$$|\langle x, y \rangle|^2 \leq \langle x, x \rangle \cdot \langle y, y \rangle \quad (10)$$

$$\mathbf{A1:} \varphi \longrightarrow (\psi \rightarrow \varphi)$$

$$\mathbf{A2:} (\varphi \rightarrow (\psi \rightarrow \theta)) \longrightarrow ((\psi \rightarrow \varphi) \rightarrow (\phi \rightarrow \theta)) \quad (11)$$

$$\mathbf{A3:} (\neg \varphi \rightarrow \neg \psi) \longrightarrow (\psi \rightarrow \varphi)$$

1.2 Medium

$$1_A = \begin{cases} 1 & \text{if } x \in A \\ 0 & \text{if } x \notin A \end{cases} \quad (12)$$

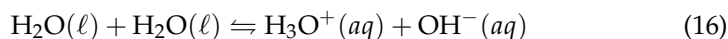
$$\underbrace{n \uparrow \dots \uparrow}_n n = n \rightarrow n \rightarrow n \quad (13)$$

In the following, not the spacing between the = and the 11 , 22 , and 33

$$\begin{aligned} 1 \uparrow 1 &= {}^11 = 1 \\ 2 \uparrow \uparrow 2 &= {}^22 = 4 \end{aligned} \quad (14)$$

$$3 \uparrow \uparrow \uparrow 3 = {}^333 = 3 \uparrow \uparrow 3 \uparrow \uparrow 3 = \underbrace{3^{3^{3^{3^{3^{\dots^3}}}}}}_{3^{3^3} \text{ threes}}$$

$$\frac{d}{dx} = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} \quad (15)$$



$$\Gamma(n+1) \stackrel{def}{=} \int_0^\infty e^{-t} t^n dt \quad (17)$$

$$\gcd(n, m \bmod n); \quad x \equiv y \pmod{b}; \quad x \equiv y \pmod{c}; \quad x \equiv y \pmod{d} \quad (18)$$

In the following, note the bold symbols.

$$\begin{aligned} \nabla \cdot \mathbf{E} &= \frac{\rho}{\epsilon_0} \\ \nabla \cdot \mathbf{B} &= 0 \\ \nabla \times \mathbf{E} &= -\frac{\partial \mathbf{B}}{\partial t} \\ \nabla \times \mathbf{B} &= \mu_0 \mathbf{J} + \mu_0 \epsilon_0 \frac{\partial \mathbf{B}}{\partial t} \end{aligned} \quad (19)$$

For the following exercise, you will need to use `\usepackage {esint}` to get the symbol \oint .

$$\begin{aligned} \oint_{\partial V} \mathbf{E} \cdot d\mathbf{A} &= \frac{Q(V)}{\epsilon_0} \\ \oint_{\partial V} \mathbf{B} \cdot d\mathbf{A} &= 0 \\ \oint_{\partial S} \mathbf{E} \cdot d\mathbf{l} &= -\frac{\partial \Phi_{B,S}}{\partial t} \\ \oint_{\partial S} \mathbf{B} \cdot d\mathbf{l} &= \mu_0 \mathbf{I}_S + \mu_0 \epsilon_0 \frac{\partial \Phi_{B,S}}{\partial t} \end{aligned} \quad (20)$$

You might find the environment `bmatrix` and `pmatrix` useful for the following exercises.

$$\rho\theta = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix} = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix} \quad (21)$$

$$\left[\begin{array}{c|ccc} 1 & 0 & \cdots & 0 \\ \hline 0 & * & \cdots & * \\ \vdots & \vdots & \ddots & \vdots \\ 0 & * & \cdots & * \end{array} \right] = \left[\begin{array}{c|ccc} 1 & 0 & \cdots & 0 \\ \hline 0 & * & \cdots & * \\ \vdots & \vdots & \ddots & \vdots \\ 0 & * & \cdots & * \end{array} \right] \quad (22)$$