1 Easy

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

$$e^{i\pi} + 1 = 0 \tag{2}$$

$$e^{i\theta} = \cos\theta + i\sin\theta \tag{3}$$

$$G_{\mu\nu} + \Delta g_{\nu\mu} = \frac{8\pi G}{c^4} T_{\mu\nu} \tag{4}$$

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

$$\overrightarrow{L} = \overrightarrow{r} \times \overrightarrow{p} \tag{6}$$

$$\sqrt[3]{2} \tag{7}$$

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

$$\sqrt{\frac{a_1^2 + \cdots + a_n^2}{n}} \geq \frac{a_1 + \cdots + a_n}{n} \geq \sqrt[n]{a_1 \cdots a_n} \geq \frac{n}{\frac{1}{a_1} + \cdots + \frac{1}{a_n}} \tag{9}$$

$$\left|\langle x, y\rangle\right|^2 \leq \langle x, x\rangle \cdot \langle y, y\rangle \tag{10}$$

$$\begin{aligned} &A1 : \varphi \longrightarrow (\psi \longrightarrow \varphi) \\ &A2 : (\varphi \to (\psi \to \theta)) \longrightarrow ((\varphi \to \psi) \to (\varphi \to \theta)) \\ &A3 : (\neg\varphi \to \neg\psi) \longrightarrow (\psi \to \varphi) \end{aligned} \tag{11}$$

2 Medium

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

$$n \underbrace{\uparrow \cdots \uparrow}_{n} n = n \to n \to n \tag{13}$$

In the following, note the spacing between the = and the ${}^{1}1$, ${}^{2}2$, and ${}^{3}3$.

$$1 \uparrow 1 = {}^{1}1 = 1$$
$$2 \uparrow\uparrow 2 = {}^{2}2 = 4$$

$$3 \uparrow\uparrow\uparrow 3 = {}^{3}3 = 3 \uparrow\uparrow 3 \uparrow\uparrow 3 = \underbrace{3^{3^{3^{3^{3^{\cdot^{\cdot^{\cdot^{3}}}}}}}}}_{3^{3^3} \text{ threes}} \tag{14}$$

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

$$H_2O(l) + H_2O(l) \rightleftharpoons H_3O^+(aq) + OH^-(aq) \tag{16}$$

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

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

In the following, note the bold symbols.

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$$
$$\nabla \cdot \mathbf{B} = 0$$
$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$
$$\nabla \times \mathbf{B} = \mu_0 \mathbf{J} + \mu_0 \varepsilon_0 \frac{\partial \mathbf{E}}{\partial t} \tag{19}$$

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

$$\oiint_{\partial V} \mathbf{E} \cdot d\mathbf{A} = \frac{Q(V)}{\varepsilon_0}$$
$$\oiint_{\partial V} \mathbf{B} \cdot d\mathbf{A} = 0$$
$$\oint_{\partial S} \mathbf{E} \cdot dl = -\frac{\partial \Phi_{B,S}}{\partial t}$$
$$\oint_{\partial S} \mathbf{B} \cdot dl = \mu_0 I_S + \mu_0 \varepsilon_0 \frac{\partial \Phi_{E,S}}{\partial t} \tag{20}$$