

Lab 8 Notes

Typesetting MATH in L^AT_EX

Module Convenor

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0.1 *(review)* inline math and display math

The mass-energy equivalence is described by the famous equation

$$E = mc^2$$

discovered in 1905 by Albert Einstein. In natural units ($c = 1$), the formula expresses the identity

$$E = m.$$

If f is continuous on the interval $[a, b]$ and F is any antiderivative of f , then

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

This is known as *Fundamental Theorem of Calculus*.

0.2 equation environment

$$\log_{27} 81 = \frac{\log_3 81}{\log_3 27} = \frac{4}{3} \tag{1}$$

$$\frac{d}{dx}(\sec x) = \sec x \cdot \tan x \tag{2}$$

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \cdots = \frac{\pi^2}{6} \tag{3}$$

$$\sum_{k=1}^n k^3 = \frac{n^2(n+1)^2}{4}$$
$$\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1 \tag{4}$$

$$\lim_{x \rightarrow \infty} \left(\frac{\sin x}{x} \right)^2 = 0$$

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} \quad (5)$$

$$\neg(p \vee q) = \neg p \wedge \neg q$$

$$y = e^x \Leftrightarrow x = \ln y \quad (6)$$

0.3 eqnarray environment

$$x + 2y - z = 0 \quad (7)$$

$$2x - 3y + 5z = 3 \quad (8)$$

$$-3y + 2z = -8 \quad (9)$$

$$\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \cos \alpha \sin \beta$$

$$\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta$$

$$\sin^2 \theta = \frac{1}{2}(1 - \cos 2\theta) \quad (10)$$

$$\cos^2 \theta = \frac{1}{2}(1 + \cos 2\theta) \quad (11)$$

0.4 align environment

$$x + 2y - z = 0 \quad (12)$$

$$2x - 3y + 5z = 3$$

$$-3y + 2z = -8 \quad (13)$$

$$\begin{aligned} p(x) &= (x - 2) \cdot (x^2 - 9) \\ &= (x - 2)(x - 3)(x + 3) \end{aligned}$$

$$\begin{aligned} (x + 2)^3 &= \binom{3}{0}x^3 + \binom{3}{1}x^2 \cdot 2^1 + \binom{3}{2}x^1 \cdot 2^2 + \binom{3}{3}2^3 \\ &= x^3 + 6x^2 + 12x + 8 \end{aligned}$$

0.5 matrix environment

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \quad (14)$$

$$\det \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} = \begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix} = 1 \cdot 4 - 2 \cdot 3 = -2$$

$$\begin{aligned} \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}^{-1} &= \frac{1}{-2} \cdot \begin{pmatrix} 4 & -2 \\ -3 & 1 \end{pmatrix} \\ &= \begin{pmatrix} -2 & 1 \\ 1.5 & -0.5 \end{pmatrix} \end{aligned} \quad (15)$$

0.6 array environment

$$\begin{aligned} \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} &= \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \\ \det \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} &= \begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix} = 1 \cdot 4 - 2 \cdot 3 = -2 \end{aligned} \quad (16)$$

$$\begin{aligned} \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}^{-1} &= \frac{1}{-2} \cdot \begin{pmatrix} 4 & -2 \\ -3 & 1 \end{pmatrix} \\ &= \begin{pmatrix} -2 & 1 \\ 1.5 & -0.5 \end{pmatrix} \end{aligned} \quad (17)$$

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases} \quad (18)$$