Contents

List of Derivations

List of Equations

1 Nice Differentials And Evaluations In Integrals

$$\int_{x=0}^{x=3} x^2 \, \mathrm{d}x = \frac{1}{3}x^3 \Big|_0^3 = 9$$

$$\int_{x=0}^{x=3} x^2 \, \mathbf{d}x = \left[\frac{1}{3}x^3\right]_0^3 = 9$$

$$\int_{x=0}^{x=3} \mathrm{d}x = x \Big|_0^3 = 3$$

$$\int_{x=0}^{x=3} \mathbf{d}x = \Big[x\Big]_0^3 = 3$$

$$\int_{r=0}^{r=R} r \, \mathrm{d}r \int_{\theta=0}^{\theta=\pi} \sin\theta \, \mathrm{d}\theta \int_{\phi=0}^{\phi=2\pi} \mathrm{d}\phi = \frac{1}{2}r^2 \Big|_0^R \cdot -\cos\theta \Big|_0^\pi \cdot \phi \Big|_0^{2\pi} = 4\pi R^2$$

$$\int_{r=0}^{r=R} r \, \mathbf{d}r \int_{\theta=0}^{\theta=\pi} \sin\theta \, \mathbf{d}\theta \int_{\phi=0}^{\phi=2\pi} \mathbf{d}\phi = \left[\frac{1}{2}r^2\right]_0^R \cdot \Big[-\cos\theta\Big]_0^\pi \cdot \Big[\phi\Big]_0^{2\pi} = 4\pi R^2$$

2 Virtual Parentheses

Virtual Parentheses

$$\left(-G\frac{m_1 m_2}{r}\right) \qquad -G\frac{(m_1 m_2)}{r} \qquad -G\left(\frac{m_1 m_2}{r}\right)$$

3 Derivation Environment

New derivation environment

$$E = \gamma m c^2 \tag{1}$$

DERIVATION 1

$$\begin{aligned} x + y &= z && \text{given} && (1\text{-}1)\\ y &= z - x && \text{solve for } y && (1\text{-}2)\\ a &= b + c + d + e + f + g + k \\ &\quad + l + m + n + o + p + q + r && \text{a very long expression that came from nowhere} && (1\text{-}3) \end{aligned}$$

$$E = h\nu \tag{2}$$

DERIVATION 2

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \quad \text{definition} \quad (2\text{-}1)$$

$$\gamma^2 = \frac{1}{1 - v^2} \quad \text{square each side} \quad (2\text{-}2)$$

$$\frac{1}{\gamma^2} = 1 - v^2 \quad \text{take reciprocal of each side} \quad (2\text{-}3)$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \quad \text{rearrange and solve for } v \text{ to get the final answer} \quad (2\text{-}4)$$

Going from Eq. (2-1) to Eq. (2-4) isn't trivial, but it's quite simple.

$$a^2 + b^2 = c^2 \quad (3)$$

DERIVATION 3

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \quad \text{definition} \quad (3\text{-}1)$$

$$\gamma^2 = \frac{1}{1 - v^2} \quad \text{square each side} \quad (3\text{-}2)$$

$$\frac{1}{\gamma^2} = 1 - v^2 \quad \text{take reciprocal of each side} \quad (3\text{-}3)$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \quad \text{rearrange and solve for } v \text{ to get the final answer} \quad (3\text{-}4)$$

DERIVATION 4

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \quad \text{definition} \quad (4\text{-}1)$$

$$\gamma^2 = \frac{1}{1 - v^2} \quad \text{square each side} \quad (4\text{-}2)$$

$$\frac{1}{\gamma^2} = 1 - v^2 \quad \text{take reciprocal of each side} \quad (4\text{-}3)$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \quad \text{rearrange and solve for } v \text{ to get the final answer} \quad (4\text{-}4)$$

DERIVATION 5

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \qquad \text{definition} \qquad (5\text{-}1)$$

$$\gamma^2 = \frac{1}{1 - v^2} \qquad \text{square each side} \qquad (5\text{-}2)$$

$$\frac{1}{\gamma^2} = 1 - v^2 \qquad \text{take reciprocal of each side} \qquad (5\text{-}3)$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \qquad \text{rearrange and solve for } v \text{ to get the final answer} \qquad (5\text{-}4)$$

DERIVATION 6

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \qquad \text{definition} \qquad (6\text{-}1)$$

$$\gamma^2 = \frac{1}{1 - v^2} \qquad \text{square each side} \qquad (6\text{-}2)$$

$$\frac{1}{\gamma^2} = 1 - v^2 \qquad \text{take reciprocal of each side} \qquad (6\text{-}3)$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \qquad \text{rearrange and solve for } v \text{ to get the final answer} \qquad (6\text{-}4)$$

DERIVATION 7

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \qquad \text{definition} \qquad (7\text{-}1)$$

$$\gamma^2 = \frac{1}{1 - v^2} \qquad \text{square each side} \qquad (7\text{-}2)$$

$$\frac{1}{\gamma^2} = 1 - v^2 \qquad \text{take reciprocal of each side} \qquad (7\text{-}3)$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \qquad \text{rearrange and solve for } v \text{ to get the final answer} \qquad (7\text{-}4)$$

DERIVATION 8

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \qquad \text{definition} \tag{8-1}$$

$$\gamma^2 = \frac{1}{1 - v^2} \qquad \text{square each side} \tag{8-2}$$

$$\frac{1}{\gamma^2} = 1 - v^2 \qquad \text{take reciprocal of each side} \tag{8-3}$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \qquad \text{rearrange and solve for } v \text{ to get the final answer} \tag{8-4}$$

DERIVATION 9

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \qquad \text{definition} \tag{9-1}$$

$$\gamma^2 = \frac{1}{1 - v^2} \qquad \text{square each side} \tag{9-2}$$

$$\frac{1}{\gamma^2} = 1 - v^2 \qquad \text{take reciprocal of each side} \tag{9-3}$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \qquad \text{rearrange and solve for } v \text{ to get the final answer} \tag{9-4}$$

DERIVATION 10

$$\gamma = \frac{1}{\sqrt{1 - v^2}} \qquad \text{definition} \tag{10-1}$$

$$\gamma^2 = \frac{1}{1 - v^2} \qquad \text{square each side} \tag{10-2}$$

$$\frac{1}{\gamma^2} = 1 - v^2 \qquad \text{take reciprocal of each side} \tag{10-3}$$

$$v = \sqrt{1 - \frac{1}{\gamma^2}} \qquad \text{rearrange and solve for } v \text{ to get the final answer} \tag{10-4}$$

$$E_K = \frac{\|\boldsymbol{p}\|^2}{(\gamma + 1)m} \tag{4}$$

This equation won't be listed.

$$E^2 = \|\boldsymbol{p}\|^2 c^2 + (mc^2)^2 \tag{5}$$

4 Current Math Fonts

`symnormal`: for vector index notation
$abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789$
$\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega$
`symbf`: for coordinate-free vectors and matrices
$\boldsymbol{abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ}$
$\boldsymbol{\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega}$
`symup`: for text labels, particles, and upright Greek
abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
$\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega$
`symbfup`: for bold text labels
abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
$\boldsymbol{\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega}$
`symsfup`: for physical dimensions
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$\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega$
`symbfsfup`: available if needed
abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
$\boldsymbol{\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega}$
`symsfit`: for tensor index notation
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$\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega$
`symbfsfit`: for coordinate-free tensors
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$\boldsymbol{\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\vartheta\iota\kappa\lambda\mu\nu\xi o\pi\varpi\rho\varrho\sigma\tau\upsilon\phi\varphi\chi\psi\omega\Delta\Gamma\Theta\Lambda\Xi\Pi\Sigma\Upsilon\Phi\Psi\Omega}$
`symcal` and `symbfcal`: for naming points and coordinate systems
$\mathcal{ABCDEFGHIJKLMNOPQRSTUVWXYZ}$
$\boldsymbol{\mathcal{ABCDEFGHIJKLMNOPQRSTUVWXYZ}}$
`symscr` and `symbfscr`: for naming spacetime events
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`symtt`: available if needed
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`symfrak` and `symbffrak`: available if needed
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$\boldsymbol{\mathfrak{abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ}}$
`symbb` and `symbbit`: available if needed
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