Contents

List of Derivations

List of Equations

1 Nice Differentials And Evaluations In Integrals

$$
\begin{gathered}
\int_{x=0}^{x=3} x^2 \ \mathsf{d}x = \frac{1}{3}x^3 \Big|_0^3 = 9 \\
\int_{x=0}^{x=3} x^2 \ \boldsymbol{\mathsf{d}}x = \left[\frac{1}{3}x^3\right]_0^3 = 9 \\
\int_{x=0}^{x=3} \mathsf{d}x = x \Big|_0^3 = 3 \\
\int_{x=0}^{x=3} \boldsymbol{\mathsf{d}}x = \Big[x\Big]_0^3 = 3 \\
\int_{r=0}^{r=R} r \ \mathsf{d}r \int_{\theta=0}^{\theta=\pi} \sin\theta \ \mathsf{d}\theta \int_{\phi=0}^{\phi=2\pi} \mathsf{d}\phi = \frac{1}{2}r^2 \Big|_0^R \cdot -\cos\theta \Big|_0^\pi \cdot \phi \Big|_0^{2\pi} = 4\pi R^2 \\
\int_{r=0}^{r=R} r \ \boldsymbol{\mathsf{d}}r \int_{\theta=0}^{\theta=\pi} \sin\theta \ \boldsymbol{\mathsf{d}}\theta \int_{\phi=0}^{\phi=2\pi} \boldsymbol{\mathsf{d}}\phi = \left[\frac{1}{2}r^2\right]_0^R \cdot \Big[-\cos\theta\Big]_0^\pi \cdot \Big[\phi\Big]_0^{2\pi} = 4\pi R^2
\end{gathered}
$$

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

$$x + y = z \qquad \text{given} \tag{1-1}$$

$$y = z - x \qquad \text{solve for } y \tag{1-2}$$

$$
\begin{aligned}
a &= b + c + d + e + f + g + k \\
&\quad + l + m + n + o + p + q + r
\end{aligned}
\qquad \text{a very long expression that came from nowhere} \tag{1-3}
$$

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

DERIVATION 2

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

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

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

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

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

$$a^2 + b^2 = c^2 \tag{3}$$

DERIVATION 3

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

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

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

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

DERIVATION 4

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

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

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

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

DERIVATION 5

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

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

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

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

DERIVATION 6

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

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

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

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

DERIVATION 7

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

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

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

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

DERIVATION 8

$\gamma = \dfrac{1}{\sqrt{1-v^2}}$	definition	(8-1)
$\gamma^2 = \dfrac{1}{1-v^2}$	square each side	(8-2)
$\dfrac{1}{\gamma^2} = 1-v^2$	take reciprocal of each side	(8-3)
$v = \sqrt{1-\dfrac{1}{\gamma^2}}$	rearrange and solve for v to get the final answer	(8-4)

DERIVATION 9

$\gamma = \dfrac{1}{\sqrt{1-v^2}}$	definition	(9-1)
$\gamma^2 = \dfrac{1}{1-v^2}$	square each side	(9-2)
$\dfrac{1}{\gamma^2} = 1-v^2$	take reciprocal of each side	(9-3)
$v = \sqrt{1-\dfrac{1}{\gamma^2}}$	rearrange and solve for v to get the final answer	(9-4)

DERIVATION 10

$\gamma = \dfrac{1}{\sqrt{1-v^2}}$	definition	(10-1)
$\gamma^2 = \dfrac{1}{1-v^2}$	square each side	(10-2)
$\dfrac{1}{\gamma^2} = 1-v^2$	take reciprocal of each side	(10-3)
$v = \sqrt{1-\dfrac{1}{\gamma^2}}$	rearrange and solve for v to get the final answer	(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

*abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ*0123456789

αβγδϵεζηθϑικλμνξοπϖρϱσςτυϕφχψωΔΓΘΛΞΠΣΥΦΨΩ

`symbf`: for coordinate-free vectors and matrices

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

αβγδϵεζηθϑικλμνξοπϖρϱσςτυϕφχψωΔΓΘΛΞΠΣΥΦΨΩ

`symup`: for text labels, particles, and upright Greek

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

αβγδϵεζηθϑικλμνξοπϖρϱσςτυϕφχψωΔΓΘΛΞΠΣΥΦΨΩ

`symbfup`: for bold text labels

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

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`symsfup`: for physical dimensions

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`symbfsfup`: available if needed

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`symsfit`: for tensor index notation

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`symbfsfit`: for coordinate-free tensors

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`symcal` and `symbfcal`: for naming points and coordinate systems

ABCDEFGHIJKLMNOPQRSTUVWXYZ

ABCDEFGHIJKLMNOPQRSTUVWXYZ

`symscr` and `symbfscr`: for naming spacetime events

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

`symtt`: available if needed

`abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789`

`symfrak` and `symbffrak`: available if needed

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

`symbb` and `symbbit`: available if needed

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