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1 Nice Differentials And Evaluations In Integrals

$$\begin{split} \int_{x=0}^{x=3} x^2 \; \mathrm{d}x &= \left. \frac{1}{3} x^3 \right|_0^3 = 9 \\ \int_{x=0}^{x=3} x^2 \; \mathrm{d}x &= \left[\frac{1}{3} x^3 \right]_0^3 = 9 \\ \int_{x=0}^{x=3} \mathrm{d}x &= x \right|_0^3 = 3 \\ \int_{x=0}^{x=3} \mathrm{d}x &= \left[x \right]_0^3 = 3 \\ \int_{r=0}^{r=R} r \; \mathrm{d}r \int_{\theta=0}^{\theta=\pi} \sin\theta \; \mathrm{d}\theta \int_{\phi=0}^{\phi=2\pi} \mathrm{d}\phi &= \left[\frac{1}{2} r^2 \right]_0^R \cdot -\cos\theta \right|_0^\pi \cdot \phi \left|_0^{2\pi} = 4\pi R^2 \right. \\ \int_{r=0}^{r=R} r \; \mathrm{d}r \int_{\theta=0}^{\theta=\pi} \sin\theta \; \mathrm{d}\theta \int_{\phi=0}^{\phi=2\pi} \mathrm{d}\phi &= \left[\frac{1}{2} r^2 \right]_0^R \cdot \left[-\cos\theta \right]_0^\pi \cdot \left[\phi \right]_0^{2\pi} = 4\pi R^2 \end{split}$$

2 Virtual Parentheses

Virtual Parentheses

$$\left(-G\frac{m_1m_2}{r}\right) \qquad -G\frac{(m_1m_2)}{r} \qquad -G\left(\frac{m_1m_2}{r}\right)$$

3 Derivation Environment

New derivation environment

$$E = \gamma mc^2 \tag{1}$$

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

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

DERIVATION 2

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

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

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

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

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

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

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

DERIVATION 3

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

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

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

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

DERIVATION 4

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

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

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

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

DERIVATION 5

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

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

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

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

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

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

DERIVATION 6

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

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

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

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

DERIVATION 7

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

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

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

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

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

DERIVATION 8

$$\gamma = \frac{1}{\sqrt{1 - v^2}}$$
 definition (8-1)

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

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

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

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

DERIVATION 9

$$\gamma = \frac{1}{\sqrt{1 - v^2}}$$
 definition (9-1)

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

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

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

DERIVATION 10

$$\gamma = \frac{1}{\sqrt{1 - v^2}}$$
 definition (10-1)

$$\gamma^2 = \frac{1}{1 - v^2}$$
 square each side (10-2)

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

$$v = \sqrt{1 - \frac{1}{\gamma^2}}$$
 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

 $abcde\ fqhijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789$

αβγδεεζηθθικλμνξοπ ϖ ροςςτυφφχψω Δ ΓΘΛΞΠΣΥΦ Ψ Ω

symbf: for coordinate-free vectors and matrices

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZαβγδεεζηθθικλμνξοπ ϖ ρρσςτυφ φ χψω Δ Γ Θ ΛΞΠΣΥ Φ Ψ Ω

symup: for text labels, particles, and upright Greek

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

αβγδεεζηθθικλμινξοπωροσςτυφφχψωΔΓΘΛΞΠΣΥΦΨΩ

symbfup: for bold text labels

abc defghijklm nop qrstuv wxyz ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

αβγδεεζηθθικλμνξοπ ϖ ρεσςτυφφχψω Δ Γ Θ Λ Ξ Π Σ Υ Φ Ψ Ω

symsfup: for physical dimensions

abcdefghijklmnopgrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

αβγδεεζηθθικλμνξοπωρρσςτυφφχψωΔΓΘΛΞΠΣΥΦΨΩ

symbfsfup: available if needed

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789 αβγδεεζηθθικλμνξοπωρρσςτυφφχψω Δ ΓΘΛΞΠΣΥΦΨ Ω

symsfit: for tensor index notation

abcdefghijkImnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

αβγδεεζηθθικλμνξοπωροσςτυφφχψωΔΓΘΛΞΠΣΥΦΨΩ

symbfsfit: for coordinate-free tensors

abcdefghijkImnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

αβγδεεζηθθικλμνξοπωρρρσςτυφφχψωΔΓΘΛΞΠΣΥΦΨ<math>Ω

symcal and symbfcal: for naming points and coordinate systems

ABCDEFGHIJKLMNOPQRSTUVWXYZ ABCDEFGHIJKLMNOPQRSTUVWXYZ

symscr and symbfscr: for naming spacetime events

abedefqhijklmnopgrstuvwxyzABCDEFGHJJKLMNOPQR8TUVWXYL

abedefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ

symtt: available if needed

abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789

symfrak and symbffrak: available if needed

abcdefghijklmnopqrstuvmrnzABCDEFGHIJKLMNDPQRGTUVWXY3

abcdefghijklmnopgrstuvwryzABCDEFGHIJRLMNDPQAGTUVWXY3

symbb and symbbit: available if needed

obcdefghijkl
mnopqrstuvwzyz ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789
 $\det i \!\!\!/ D$