The Multivariate Calculus Merry Christmas Equation looks like this:

$$\frac{2}{e^{y\theta}} \int_0^r \theta d\theta \frac{\partial}{\partial\theta} e^{y\theta} = \frac{3}{4m\pi} \int \frac{dx}{\frac{x}{m} - as} \int_0^{2\pi} \int_0^{\pi} \int_0^{1} r^2 sin(\theta) dr d\theta d\rho$$

Let's solve it!

Strategy: Begin by solving the left side of the equation, breaking it down step by step. Once completed, multiply all individual results together. Next, turn your attention to the right side of the equation and solve it step by step as well. Combine its separate solutions through multiplication. With both sides resolved, you will uncover a delightful Christmas solution waiting to be revealed.

Step 1: Evaluate $\int_0^r \theta d\theta$.

$$\int_0^r \theta d\theta = \frac{1}{2}\theta^2 \Big|_0^r = \frac{1}{2}(r^2 - 0^2) = \frac{1}{2}r^2$$

Step 2: Evaluate $\frac{\partial}{\partial\theta} e^{y\theta}$.

$$\frac{\partial}{\partial\theta} e^{y\theta} = y e^{y\theta}$$

Step 3: Multiply the solutions from Steps 1 and 2 with $\frac{2}{e^{y\theta}}$.

$$\frac{2}{e^{y\theta}} \cdot \frac{1}{2} r^2 \cdot y e^{y\theta} = \frac{3}{4m\pi} \int \frac{dx}{\frac{x}{m} - as} \int_0^{2\pi} \int_0^{\pi} \int_0^{1} r^2 sin(\theta) dr d\theta d\rho$$

Step 4: Simplify the left side of the equation.

$$r^2 y = \frac{3}{4m\pi} \int \frac{dx}{\frac{x}{m} - as} \int_0^{2\pi} \int_0^{\pi} \int_0^{1} r^2 sin(\theta) dr d\theta d\rho$$

Step 5: Rewrite the triple integral $\int\limits_0 \int\limits_0 \int\limits_0 r^2 sin(\theta) dr d\theta d\rho$ into 3 separate integrals.

$$\int\limits_0^{2\pi} \int\limits_0^{\pi} \int\limits_0^{1} r^2 sin(\theta) dr d\theta d\rho = \left(\int_0^{2\pi} d\rho\right)\left(\int_0^{\pi} sin(\theta) d\theta\right)\left(\int_0^{1} r^2 dr\right)$$

Step 6: Evaluate $\int_0^{2\pi} d\rho$.

$$\int_0^{2\pi} d\rho = \rho\Big|_0^{2\pi} = (2\pi - 0) = 2\pi$$

Step 7: Evaluate $\int_0^{\pi} sin(\theta) d\theta$.

$$\int_0^{\pi} sin(\theta) d\theta = -cos(\theta)\Big|_0^{\pi} = -cos(\pi) - (-cos(0)) = -(-1) + 1 = 2$$

Step 8: Evaluate $\int_0^1 r^2 dr$.

$$\int_0^1 r^2 dr = \frac{1}{3} r^3\Big|_0^1 = \frac{1}{3}(1^3 - 0^3) = \frac{1}{3}$$

Step 9: Multiply the solutions from Steps 6, 7 and 8 with $\frac{3}{4m\pi}$.

$$r^2 y = 2 \cdot \frac{1}{3} \cdot 2\pi \cdot \frac{3}{4m\pi} \int \frac{dx}{\frac{x}{m} - as}$$

Step 10: Simplify the right side of the equation.

$$r^2y = \frac{1}{m}\int \frac{dx}{\frac{x}{m} - as}$$

Step 11: Rewrite $\int \frac{dx}{\frac{x}{m}-as}$.

$$\int \frac{dx}{\frac{x}{m} - as} = \int \frac{1}{\frac{x}{m} - as}dx$$

Step 12: Apply U-Substituiton to the $\frac{1}{m}\int \frac{1}{\frac{x}{m}-as}dx$ integral.

$$\frac{1}{m}\int \frac{1}{\frac{x}{m} - as}dx$$

$u = \frac{x}{m} - as$

$\frac{d}{dx}[u] = \frac{d}{dx}[\frac{x}{m} - as] \rightarrow du = \frac{1}{m}dx \rightarrow m \ \ du = dx$

$$\frac{1}{m}\int \frac{1}{\frac{x}{m} - as}dx = \frac{1}{m}\int \frac{m}{u}du$$

Step 13: Simplify and evaluate U-sub integral.

$$\int \frac{1}{u}du = ln(u) + C = ln(\frac{x}{m} - as) + C$$

Step 14: Set C = 0.

$$ln(\frac{x}{m} - as)$$

Step 15: Write the current Christmas equation and solve it.

$$r^2y = ln(\frac{x}{m} - as)$$

$$e^{r^2y} = e^{ln(\frac{x}{m} - as)}$$

$$e^{r^2y} = \frac{x}{m} - as$$

$$me^{r^2y} = x - mas$$

$$\boxed{me^{rry} = x - mas}$$