

Exam 2 Cover Sheet

Show all work. You must give sufficient justification for your answers — no credit will be given for answers that are unaccompanied by an explanation and/or clearly written calculations.

There are 10 problems for a total of 125 points possible on this exam.

Good luck!

You may leave m 's and c 's in your answers.

Equations from Exam 1

$$x' = \gamma(x - vt)$$

$$t' = \gamma\left(t - \frac{v}{c^2}x\right)$$

$$u' = \frac{u - v}{1 - \frac{uv}{c^2}}$$

$$\Lambda = \begin{pmatrix} \gamma & -\gamma\beta & 0 & 0 \\ -\gamma\beta & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$v = \frac{pc^2}{E}$$

$$E^2 - p^2c^2 = m^2c^4$$

Equations from Exam 2

$$\delta(g(x)) = \sum_{i=1}^n \frac{\delta(x - x_i)}{|g'(x_i)|}$$

$$L_x = yp_z - zp_y$$

$$L_y = zp_x - xp_z$$

$$L_z = xp_y - yp_x$$

$$p_x = -i\hbar \frac{\partial}{\partial x}$$

$$[x, p_x] = i\hbar$$

$$L_{\pm} = L_x \pm iL_y$$

$$[L_z, L_{\pm}] = \pm\hbar L_{\pm}$$

$$[L^2, L_{\pm}] = 0$$

$$dN = -N\Gamma dt$$

$$\frac{d\sigma}{d\Omega} = \frac{b}{\sin\theta} \frac{db}{d\theta}$$

$$\Gamma = \frac{S}{2\hbar m_1} \int |\mathcal{M}|^2 (2\pi)^4 \delta^4(p_1 - p_2 - p_3 - \dots - p_n) \prod_{j=2}^n 2\pi \delta(p_j^2 - m_j^2 c^2) \theta(p_j^0) \frac{d^4 p_j}{(2\pi)^4}$$