

```
Forces + Electromagnetism in GR introduced (cont.)
                     22 October 2017
                                                                                       06:19 PM
                     Pecall: I free particle moves along a geodecie \frac{d^2x^{\mu}}{dt^2} + \frac{1}{1} \frac{dx^{\rho}}{dt} = 0 where \frac{dx^{\mu}}{dt} \frac{dx^{\rho}}{dt} = 0 where \frac{dx^{\mu}}{dt} \frac{dx^{\nu}}{dt} - 1
                    austion: If there's a "force" how do we contrate the LHS?
                     then: We can use the principle of equivalence. While this is not "sacred" it is correct to a very good
                                       Goto a frame where Tim = 0 so that gur = yur by the equir principle
                     NB: In this frame, the ego of motion becomes d'x" = for force in the absence of granty
                                           in local inertial frame, The principle of equivalence says that the eg' of motion should look exactly as though there's no grainty
                    More Babble: Consider having a rocket you've tested in the absence of granty & know f, the acceleration of the rocket. The principle of equivalence tells us that the eg^ well be the same in this special local inertial frame.
                       NB: It cent comment to been changing frames so
                                                                                                                                                                                                              (7000: This I couldn't figure; need to drive the parallel
                       Consider of general coordinate system 7, where
                                                                                                                                                                                                                                                                                                        transport eg"/goodesiceg"
                                                             \frac{d^2 r'^{M}}{dr^2} = \partial_{\gamma} r'^{M} \left( \frac{d^2 r^{V}}{dr^2} + \bigcap_{\rho \sigma} \frac{dr^{\rho}}{Ar} \frac{dr^{\sigma}}{Ar^2} \right)
                                                                                                                                                                                                                                                                                                       Churas out it was an exercise
                                                                                                                                                                                                                                                                                                        Unre also which I remember,
                               \partial \left(\partial_{\mu}^{\prime} \chi^{\alpha}\right) \partial_{\nu} \chi^{\prime \mu} \left(\frac{\partial^{\prime} \iota^{\nu}}{\partial z^{\nu}} + \prod_{i=1}^{\nu} \frac{\partial \iota^{\nu}}{\partial z^{\nu}}\right) = \int_{\mu}^{\mu} \left(\partial_{\mu}^{\prime} \chi^{\alpha}\right)
                                                            \frac{d^2 x^{\alpha}}{dz^2} + \int_{0}^{\alpha} \frac{dx^{\beta}}{dz} \frac{dx^{\sigma}}{dz} = \frac{\partial_1}{\partial x^{\alpha}} x^{\alpha} + \int_{0}^{\alpha} \frac{dx^{\sigma}}{dz} \frac{dx^{\sigma}}{dz} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{dz} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x^{\sigma}} x^{\alpha} + \frac{\partial_1}{\partial x^{\sigma}} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x} \frac{\partial_1}{\partial x} \frac{dx^{\sigma}}{\partial x} = \frac{\partial_1}{\partial x} \frac{\partial_1}{\partial x} \frac{\partial_1}{\partial x} = \frac{\partial_1}{\partial x} \frac{\partial_1}{\partial x} + \frac{\partial_1}{\partial x} \frac{\partial_1}{\partial x} = \frac{\partial_1}{\partial x} 
                       NB: We didn't assume that f is a vector. | We just determined that f' can be computed
                      Consider. X is anothe coordinate system
                                                 Eg " in the " coordinate will be don't the start of " a f" x a f' M
                           Ex: {"" = 3, x " x fB (casy exercise) essentially sayery that of indeed transforms like acceptance
Consides: Force due to an external field, e.g. Electromagnetic force
   Idea: Same as earlies, we principle of equivalence;
   Recall: m dr = q n Fmp dx? ; c=1 unit where Fxp = dxAp - dxx; Az = {Ao,A,A,A,A}
                                                                                                                                                                                                                                                                                           V Electrostatie Vector potential
                                                                                                                                                        Not sure why -
                                          E_i = -F_{0i} = \delta_i A_0 - \delta_0 A_i = -\nabla \phi - \frac{\delta A}{\delta + 1}
                                          B_i = \frac{1}{2} \sum_{j_1 k} F_{j_2 k} which componentiese is B_1 = 3_2 A_3 - 3_3 A_2 B_2 = 3_2 A_1 - 3_1 A_2 casentilly is B = \nabla \times A
 Consides: \mu=i case, \frac{d}{dz}\left(m\frac{dx^{i}}{dz}\right)=q\frac{n^{i,j}\left(F,\rho\frac{dx^{j}}{dz}\right)}{dz}=q\left(F_{i,0}\frac{dx^{0}}{dz}\right)+F_{i,k}\frac{dx^{k}}{dz}\right) using F_{i,0}=-F_{0,k} by instance this proper
                                                                                                                                                = q(E; dro + E; k1 B | dre) pistify this properly
                                                         d2%2
                dpi dpi at = dpi at = q (F; + E; ro Bo dx ") NB: The pi has 2 still at at ar
```



