C6.1  $\chi^{\mu}$   $\rightarrow$   $\chi^{\nu}$  =  $\chi^{\nu}$ 1)  $x_{\mu} = g_{\mu\nu} x^{\nu} \longrightarrow g^{\mu\nu} x_{\mu} = x^{\nu}$ to show X'n = Xv(1) 1 u (=> X 1 1 4 1 = X v LHS = gnax'a 1" = 10 B X B gaz Mu = XB 1 & B gna / h det XB g B V = XV = RHS  $\chi^{\mu}y_{\mu}$ ,  $\chi^{\prime}\mu$  =  $\chi^{\prime}\mu$  =  $\chi^{\prime}\mu$  =  $\chi^{\prime}\mu$ 21 = 1 x guv 1 By B  $\hat{z} \wedge \hat{z} \wedge = g$ = x × y ~ (6.2 { xm, xv} = 29mv 14 85:=1887723 a) i) dud = gur y v z m = 1 (3m + 8m) 2 7 m = \frac{1}{2} (9mv x v x m + gvm x x m) = = (3m x x x + 8m x x x) = 2 gm { r, r } = 1 gm 2 gm 1

```
= 9 m g nv 14 = 414
              ru z v z m = ru y v z m = ru { [ x m, x r ] - x m z r }
      li)
                               i) = Yu - 2 g m 1 4 - Yu 3 m 8.
                               = 2 \gamma^{\nu} - 4 \gamma^{\nu} = -2 \gamma^{\nu}
      (ii) Ym Y x x y g y m
             = x x x x 2 ( { x y, x m } - x m y 9)
             = rn r r 2 (29 sm 14 - r n r))
            = 2 \gamma^{\beta} \gamma^{\gamma} \gamma^{\lambda} - \gamma_{\mu} \gamma^{\nu} \gamma^{\lambda} \gamma^{\mu} \gamma^{\beta}
                                     = - ra r v ({x 2, r n} - r n r 2) r s
                                     = - rur (29 2 14 - r r ) }
                                    = -272 8 8 4 7 2 7 2 7 2 8 5
                                                            = -27 728
       = 2 \gamma^{\beta} \gamma^{\gamma} \lambda + 2 \gamma^{\lambda} \gamma^{\nu} \gamma^{\beta} - 2 \gamma^{\gamma} \gamma^{\lambda} \gamma^{\beta}
       = 2\gamma^{\beta} \delta^{\gamma} \gamma^{\lambda} - 2(\gamma^{\lambda} \gamma^{\gamma} + \gamma^{\gamma} \gamma^{\lambda}) \gamma^{\beta}
       = 2 x 3 x x 2 - 2 - 2 9 x 14 x 9
      = \gamma \beta \left( 2 \gamma^{\nu} \gamma^{\lambda} - 4 9^{\lambda \nu} 1_{4} \right)
      = \gamma^{\beta} \left( 2 \gamma^{\gamma} \gamma^{\lambda} - 2 \left\{ \gamma^{\lambda}, \gamma^{\nu} \right\} \right)
      = r^{9} \left( 2r^{2} + r^{2} - 2r^{2} + r^{2} + 2r^{2} + r^{2} \right)
     = - 2 7 9 7 2 7
      Tr (rugy) = Tr (-8 8 + 29 m 14)
                             = - Tr ( 8 m 8 v ) + 2 · g m Tr ( 14)
                 => Tr (rm rv) = 4,9 mv
ri) Tr(pk) = Tr(rupurkv) = Tr(rurvpukv)
                       = Pnkv 43mv = 4 (k.P)
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vii) { x s, x h } = i { x o x 1 x 2 x 3, x h }  $V(i) \qquad Tr(Y_{\xi}) = Tr(Y^{0}Y^{0}) = -Tr(Y^{0}Y^{0}) = -Tr(Y^{0}Y^{0})$ => Tr ( Y° Y° Y5) = Tr ( Y5) 20  $(\gamma_5)^2 = -\frac{\gamma^0 \gamma^1 \gamma^2 \gamma^3 \gamma^0 \gamma^1 \gamma^1 \gamma^3}{-1 \gamma^0 \gamma^0 \gamma^0 \gamma^0 \gamma^0 \gamma^0 \gamma^1 \gamma^2 \gamma^3}$ = - 1 72 73 77 72 73 = - (-1) 3 = 14 Tr ( } " } " - - - } " ) = X)