

1. What is the rank of the following tensors?

a. T^{ab}_{cd}

b. Φ

c. $M^{\mu}_{\nu} X^{\nu}$

2. What is the metric tensor for 3-D cylindrical space? The inverse?

3. Transform the vector $[A^a] = (3, 4)$ from Cartesian to Polar coordinates, and then convert the result into a one-form in Polar coordinates

4. Transform the one-form $[A_a] = (3, 4)$ from Cartesian to Polar coordinates, and then convert the result into a vector in Polar coordinates

5. Convert the one-form $[A_a] = (7, r, \tan\theta)$ in spherical coordinates to a vector