

Selected Solutions for *An Introduction to Tensors and Group Theory for Physicists, 2nd ed.*

October 3, 2018

Introduction

This is an incomplete, evolving solutions manual to [Jee15]. Note that this is the second edition of this text, and that exercise and problem numbering differs between editions. Solutions posted here have primarily been written by students in courses I taught in the UC Berkeley Physics department between 2012 and 2016. If you are interested in improving existing solutions or adding new ones of your own, please email me at nadirj@princeton.edu.

1 A Quick Introduction to Tensors

2 Vector Spaces

Exercise 2.1 : Verify equation 2.7, which states

$$\Delta_{S^2} Y(\theta, \phi) = -l(l+1)Y(\theta, \phi).$$

Solution: Pick a vector $f \in \mathcal{H}_l(\mathbb{R}^3)$. This function has two useful properties: in spherical coordinates, we may write our function as $f(r, \theta, \phi) = r^l Y(\theta, \phi)$ – this is a property of $P_l(\mathbb{R}^3)$, which contains $\mathcal{H}_l(\mathbb{R}^3)$ as a subspace. And, since we have chosen it from $\mathcal{H}_l(\mathbb{R}^3)$, it satisfies $\Delta f = 0$. We write the Laplacian explicitly and combine terms

$$\begin{aligned}\Delta f &= \left(\frac{\partial^2}{\partial r^2} + \frac{2}{r} \frac{\partial}{\partial r} + \frac{1}{r^2} \Delta_{S^2} \right) r^l Y(\theta, \phi) \\ &= l(l-1)r^{l-2}Y + \frac{2}{r}lr^{l-1}Y + r^{l-2}\Delta_{S^2}Y \\ &= l(l-1)r^{l-2}Y + 2lr^{l-2}Y + r^{l-2}\Delta_{S^2}Y \\ &= l(l+1)r^{l-2}Y + r^{l-2}\Delta_{S^2}Y\end{aligned}$$

But we know this quantity is equal to zero. Therefore,

$$\Delta_{S^2} Y(\theta, \phi) = -l(l+1)Y(\theta, \phi)$$

as claimed. Thus all harmonic l -degree polynomials correspond to a matching spherical harmonic, which corresponds to the restriction of the said polynomial to the unit sphere.

Exercise 2.3 : Given a vector v and a finite basis $\mathcal{B} = \{e_i\}_{i=1, \dots, n}$, show that the expression of v as a linear combination of the e_i is unique.

Solution: Suppose that our representation of v in the basis \mathcal{B} is explicitly given by $v = a^i e_i$, where the a^i are scalars in the appropriate field. Now, suppose that there exists another representation of v in the same basis, given by $v = b^i e_i$. Then we may write:

$$\begin{aligned}v - v &= 0 \\ &= a^i e_i - b^i e_i \\ &= (a^i - b^i) e_i\end{aligned}$$

Group Theory Solutions Manual

A Loxley



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web feb 15 2022 wondering from those of you who have taken a pre employment assessment what degree of difficulty should i expect did you find it easier or harder than the cpc exam i took the exam in september and scored in the 90 s on my first try but i have zero experience in coding or in the medical field in general

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web when the truth is most companies that hire medical coders require a pre hire test this test measures a coder s coding skill and often this exam will expose whether or not a coder knows how to code correctly the inability to code correctly is the primary reason why medical coders are unable to find employment

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web test question included some multiple choice some icd 10 questions like what is the diagnosis code for type 2 diabetes with peripheral neuropathy and general questions about coding guidelines my biggest tip is to bring a small portable clock

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web dec 21 2021 however it is to be noticed that this pre employment test considers the medical history and general musculoskeletal screening before the prospect gets hired this provides a baseline in case such information is needed at a later time during emergencies the coding technical pre employment exam helped shortlist candidates aligned with