title: Notes on Differential Forms author: Jad Nohra geometry: margin=3cm mainfont: 'Charter'

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'Vector Calculus, Linear Algebra And Differential Forms, A Unified Approach' (Hubbard et.) ([VLDU], [Hubbard], lin-alg, vec-calc, diff-form, unif, condenser, for-idiots, pre-classic)

1. p499, (intro-gold).
2. p517,

   > The real difficulty with forms is imagining what they are. What "is" dx ^ dx2 + dx3 ^ dx4

3. p123, (fringe). A simple fringe function where the idea of linear approximation breaks. It is also an 'arithmetic fringe' in the sense that the derivative is has no limit at a point, but using the 'more basic' limit definition, the derivative has a value at that point.
4. p420, (finally). Finally! A proof for the relation between a determinant and a volume for any dimension, in a book that relates differential forms to this. 'Theorem 4.9.1(The determinant measures volume).'
5. p501. In fact the relation between forms and determinants is direct.
6. p513, (misnomer). "Differential form" is one of the best misnomers so far, pinpointed while introducing Form fields.

   > The world "field" means data that varies from point to point. The number a form field gives depends on the point at which it is evaluated. A k-form field is also called a "differential form" as it is used in first year calculus. We know a professor who claims that he has been teaching "differentials" for 20 years and still doesn't know what they are

7. (blunting-nirvana). The blunting nirvana phenomenon is an extremely common one in the world, in education, and also in mathematics. We had scratched its surface when we realized that solving a solved problem is not as motivating as solving an unsolved one, that many solutions are much more trivial than they look like, but look imposing

because one never tries the actual calculations himself. When one is offered the solution for a problem one does not have, one is transported into a world where all related problems can be simply solved. If the solution is additionally very "intuitive", one could take it as the only way to see the problem and the world in general. This makes him even more blunt. Additionally, based on the never trying theory above, one then tends to regard the solution as amazingly transcendental, and its inventor as genius (sharp and not blunt). The better the solution is in dealing with more and more problems, the more pronounced the effects are, the the more difficult it is to resharpen oneself.

8. (diff-form). Differential forms, the way usually presented suffer from (blunting-nirvana). The problem being a general and elegant way to integrate in arbitrary dimensions on arbitrary manifolds. Or maybe better, the reach the generalized Stokes theorem, but this goal or "problem" is only explicitly stated in this book out of many others. It might be true is not enough time to first try to deal with all problems, but that should be explicitly stated and one should at least try to deal with such problems.
9. p527, (gold). orientation on manifolds.
10. p554, (gold, vec-calc, diff-form, phys, unif, interpret).

'Gravitation' (Misner et.) ([G], diff-form, physics)

1. p59,

   > Gradient a 1 -form? How so? Hasn't one always known the gradient as a vector?

2. This books seems to validate our ('machines').
3. A simple question that is not asked and answered is: what problem was bothering Einstein? Why was he trying to change anything?
4. p11. There is no need to make 'coordinate singularity' sound so interesting. It is yet another (translation) artifact. Note how this loops us all the way back to the idea of basing the rational numbers on the 'coordinate system' where $sqrt(2)$ is 1. More precisely, translating geometric figures, having a square with diagonals, relabeling the diagonals as 1. But we know that this creates other irrationals. the fringe called irrationality, as we know from information, computation and the paradox of infinity, is independent of coordinates.
5. p10. An unfair (overstatement): 'This circumstance emphasizes anew that points and events are primary, whereas coordinates are a mere bookkeeping device.'
6. p10. (Big theorem) in topology, again one of impossibility in general, of a single coordinate system.
7. p10. A courageous short statement on the limit link between the world and mathematics, and p13 promises to elaborate much later as this is advanced.. Can we also include this under (translation)?

8. p10. (Take-magic) talk on dimensionality. Another kind is (let-magic), and the complaint is: you did not at least try to justify why you thought about "taking" or "letting".
9. p16. We must agree, even with the exclamation. But to be fair, we already know that this "old" point of view is a necessary consequence of world experience and technology, the ability to measure and see. More concretely, nowhere in the world until recently was it possible to not drop something and see it fall, like in the proposed free fall situations. 'Forego talk of acceleration! That, paradoxically, is the lesson of the circumstance that "all objects fall with the same acceleration." Whose fault were those accelerations, after all? They came from allowing a groundbased observer into the act.'
10. p13. We must agree on the Importance of the 'Roll-Krotkov-Dicke experiment' (pedanto).

'Differential Equations: A Dynamical Systems Approach. Ordinary Differential Equations' (Hubbard) ([DEDS1], [Hubbard] diff-eq, pre-classic, ineq)

1. pix. (intro-gold).

'Intermediate Dynamics for Engineers' (O'Reilly) ([IDFE], dyn-sys)

1. p39. (dyn-sys-jac).

Topic: Constrained Dynamical Systems and the 'Jacobian'

1. A possible reference is [IDFE]

Topic: Gradient

1. Notes are in [h-notes] p35', and they relate to 'Elementary differential geometry, Pressley'

Project: NSA-Complex, q-calc

1. In ‘Lectures on Hyperreals’, Goldblatt says (p47). “For instance, by replacing R by C this would give us a way of embarking on the nonstandard study of complex analysis” I have not found much about such a project! It did lead me to q-calculus though.