



Contents of Mathematics-Minor Courses for Physics-Major Students

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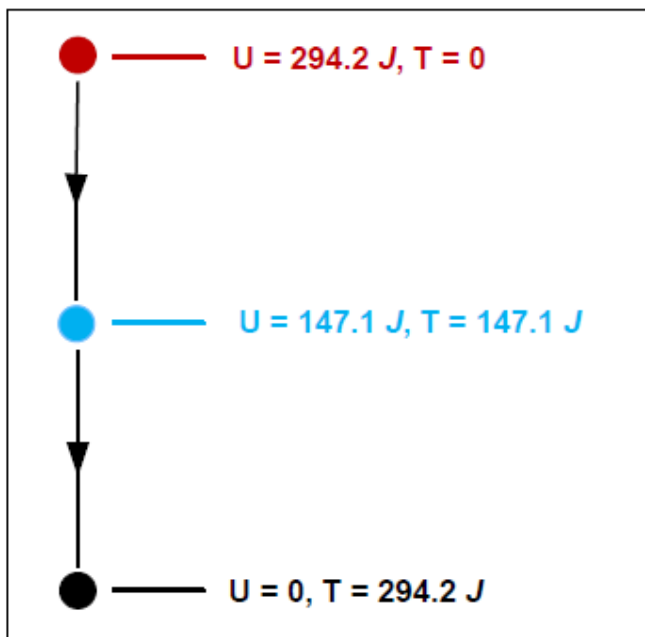


Fig. 1. Demonstration of the necessity of use of negative sign for the computation of gravitational potential energy (detailed calculations in Additional File)

vistic kinematics, [astrodynamical coordinates to model planetary orbits](#)), *c*) understanding that setting up a physical problem closer to the natural symmetries of a system (using appropriate curvilinear-coordinate meshes) shall render the equation simple to visualize and to handle (*e. g.*, using plane-polar and spherical-polar coordinates for problems having circular and spherical symmetries, respectively) — main consideration in [choice of gaussian surface](#) and enunciation of [strong Noether's theorem](#), *d*) applying exponentials to study of radioactive decay and charging of a capacitor, *e*) obtaining solutions of the second-order-linear-differential equation to study damped and driven oscillations and appreciate the phenomenon of resonance, *f*) learning the mathematical basis of continuity of wave-functions and their derivatives in quantum mechanics (same reasoning for continuity of electrostatic and gravitational potentials — example in [Additional File](#) to demonstrate gravitational-potential computation inside and outside of a mass distribution, say earth, including intelligent choice of [gaussian surface](#)). [Additional File](#), also, includes detailed calculations to justify use of negative sign for computation of potential energy (Fig. 1). This lecture is dedicated to the loving memory of **Professor Mohammed Athar Ali Khan** (Friday, July 1, 1932 AC: Safar-ul-Muzaffar 26, 1351 AH, Sitapur, U. P., British India — Thursday, May 6, 2021 AC: Ramadhan-ul-Mubarak 23, 1442 AH, Karachi, Pakistan; funeral prayers on Friday, May 7 after Jummatul Widaa; father: Ahmed Ali Khan; mother: Syeda Kulsoom Begum). The speaker's mother was, also, born in Sitapur. Professor Khan was a cousin of the speaker and motivated him to take interest in the subject of education (Fig. 2). He helped the speaker's family in difficult times. In 1999, he invited the speaker as Subject Expert (Mathematics) in FDP Intensive Workshop at [Commecs Institute of Business and Engineering Sciences](#). He completed his matriculation in 1918 from Bareilly, U. P., British India, and intermediate from the [Aligarh Muslim University](#). In 1950, he migrated to Pakistan and settled in Karachi. He graduated from Islamia College and completed his BEd from Government Teachers' Training College in 1957, followed by MA (Geography) and MEd from [University of Karachi](#). He obtained MA (Education) from [American University of Beirut](#) in 1969. He, also, completed diploma in Educational Planning and Management, a course in Project Planning from England as well as a special course in Technical Education availing UNESCO scholarship. He started his professional career in 1961 as Lecturer (Education) working in Government Teachers' Training College, promoted to Assistant Professor in 1974 and Professor in 1978. In 1979, he was transferred to Jamia Millia Government College as Principal. He served there for 10 years and then was appointed Principal in Government College of Education in 1989. For a full term of 3 years, he served as Dean, [Faculty of Education, University of Karachi](#). During 1993-1994, he served as Acting Director, Hamdard Institute of Education. During 1998, he was National Consultant, Science and Teacher Education. Since 1994, he had been associated with [Hashmat Memorial College of Education](#) and Visiting Faculty in Department of Education, [Hamdard University](#). In an interview, published in [JANG](#) on Thursday, July 24, 2008, he spelled out the qualities of a good teacher — sincerity with interest and passion for the profession. A teacher must have deep knowledge of the subject, which he is entrusted to teach. He leaves behind his wife and 3 daughters. His only son expired during his lifetime. The education community suffered a tremendous loss by his sad demise. May *Allah-Izz-o-Jal* rest his soul in eternal peace!

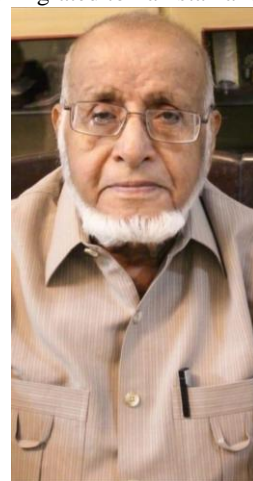


Fig. 2. Mohammed Athar Ali Khan

Keywords: Choice of gaussian surface • Conservative forces (seen by a mathematician and a physicist) • Continuity of wave-functions/derivatives in quantum mechanics • Negative sign in potential-energy computation • Symmetry and conservation laws (strong Noether's theorem)

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