SUYUQLIKNING BOSIM KUCHINI HISOBLASHDA ANIQ INTEGRALNI QO'LLANILISHI

Djanizoqov Ulug'bek Abdug'oniyevich
Jizzax politexnika instituti katta o'qituvchisi
udjonuzoqov@gmail.com, tel: (93) 293 59 70.

Axmatov Shahboz Shirinqul o'g'li
Jizzax politexnika instituti talabasi

Annotatsiya:
Ushbu maqolada aniq integralning fizikaviy masalalarga tatbiqi qaralgan bo'lib, aniq integral yordamida suyuqlikning bosim kuchini hisoblash doir masalalar qisqa va sodda usullar yordamida bayon qilingan hamda ishlab ko'rsatilgan.

Kalit so'zlar: vaqt, tezlik, zichlik, erkin tushish tezlanishi, yig'indi, limit, integral.

ПРИМЕНЕНИЕ ОПРЕДЕЛЕННОГО ИНТЕГРАЛА ПРИ ИЗМЕРЕНИИ СИЛЫ ДАВЛЕНИЯ ЖИДКОСТИ

Джонизаков Улугбек Абдуганиевич
Джизакский политехнический институт, ст.преподаватель
udjonuzoqov @ gmail.com, тел: (93) 293 59 70.

Ахматов Шахбоз Ширинкул угли
Студент Джизакского политехнического института

Аннотация:
В данной статье рассматривается применение определенного интеграла к физическим задачам, а также описываются и демонстрируются проблемы измерения силы давления жидкости с использованием определенного интеграла с использованием коротких и простых методов.

Ключевые слова: время, скорость, плотность, ускорение свободного падения, сумма, предел, интеграл.

APPLICATION OF A CERTAIN INTEGRAL IN MEASURING THE FORCE OF LIQUID PRESSURE

Dzhonizakov Ulugbek Abduganievich
Jizzakh Polytechnic Institute, senior teacher
udjonuzoqov @ gmail.com, tel: (93) 293 59 70.

Akhmatov Shahboz Shirinkul oglu
Student of Jizzakh Polytechnic Institute

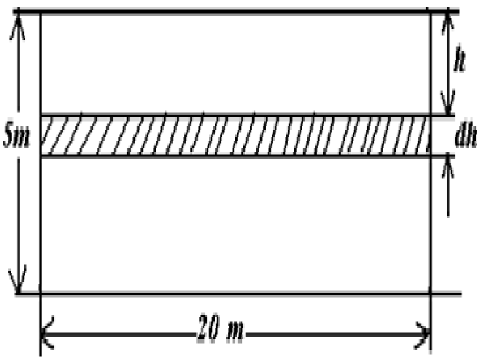
Abstract:
This article discusses the application of the definite integral to physical problems and describes and demonstrates the problems of measuring the fluid pressure force using the definite integral using short and simple methods.

Keywords: time, velocity, density, acceleration due to free fall, sum, limit, integral.

Suyuqlikning bosim kuchini hisoblash uchun Paskal qonunidan foydalaniladi, unga ko'ra cho'kish (botish) chuqurligi h - bo'lgan S yuzga suyuqlikning bosim kuchi

$$P = \rho g h S$$

ga teng, bu yerda ρ -suyuqlikning zichligi, $g \approx 9{,}807$ erkin tushish tezlanishi.

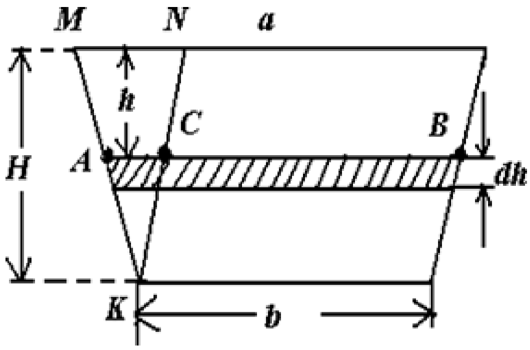


1-chizma

1-misol. Vertikal to'g'on asosi $20\ m$ va balandligi $5\ m$ bo'lgan to'g'ri to'rtburchak shaklida (suvning sathi to'g'onning yuqori asisi bilan barobar), suvning butun to'g'onga bosim kuchini toping (1- chizma).

Yechish. Paskal qonuniga muvofiq: $P = \rho g h S = 9807 h S\ (N)$ (suv uchun $\rho g = 1000 \cdot 9{,}807 N / m^3$ ya'ni bosim kuchi h - chuqurlikning birorta $P(h)$ -funksiyasidan iborat. Eni juda kichik dh - ga teng shtrixlanagan to'g'ri to'rtburchakni olib uni h chuqurlikda gorizontal joylashgan deb faraz qilamiz. U holda bu bo'lakchaga bo'lgan bosim kuchi

$$dh = 9807 h \cdot 20 dh = 9807 \cdot 20 h dh$$



2-chizma

bo'ladi. Buni 0 dan 5 gacha integrallab suvning butun to'g'onga bosim kuchini topamiz:

$$P = 9807 \cdot 20 \int_0^5 h dh = 9807 \cdot 10 h^2 \Big|_0^5 = 9807 \cdot 250(N) = 2451750(N) = 2{,}45(MN).$$

2-misol. Vertikal to'g'on teng yonli trapetsiya shaklida bo'lib, yuqori asosi $a = 6{,}4\ m$, pastki asosi $b = 4{,}8\ m$, balanligi esa $H = 3\ m$. Suvning butun to'g'onga bosim kuchini toping (2-chizma).

Yechish. Trapetsiyaning shtrixlangan bo'lakchasi h chuqurlikda gorizontal joylashgan va u tomonlari *AB* va dh bo'lgan to'g'ri to'rtburchakdan iborat deb faraz qilamiz. U holda bu bo'lakka bo'lgan suvning bosimi.

$$dP = 9807 h |AB| dh = 9807 h |AC + CB| dh = 9807 h |AC + b| dh (N)$$

bo'ladi. *AC* ni *KAC* va *KMN* uchburchaklarning o'xshashligidan topamiz:

$$\frac{AC}{MN}=\frac{H-h}{H}, \quad \frac{AC}{a-b}=\frac{H-h}{H} \quad \text{yoki} \quad AC=(a-b)\frac{H-h}{H}$$

Bu ifodani h bo'yicha *0* dan *H* gacha integrallab, butun to'g'onga ta'sir etayotgan bosim kuchini topamiz:

$$P=9807\frac{1}{H}\int_0^H h\left|AC+b\right|dh=9807\frac{1}{H}\int_0^H h\left|(a-b)(H-h)+b\right|dh=$$

$$=9807\frac{1}{H}\int_0^H (aHh-(a-b)h^2+b(1-H))dh=$$

$$=9807\frac{1}{H}\left(\frac{aH}{2}h^2-\frac{a-b}{3}h^3+b(1-H)h\right)\Big|_0^H=$$

$$=9807\frac{1}{H}\left(\frac{aH^3}{2}-\frac{a-b}{3}H^3+b(1-H)H\right)=$$

$$=9807\frac{1}{6}\left(a+2b\right)H^2+9807(b-bH)$$

Bunga $a=6,4\ m,\ b=4,8\ m,\ H=3\ m$ qiymatlarni qo'yib, topamiz:

$$P=9807\frac{1}{6}\left(a+2b\right)H^2+9807(b-bH)=$$

$$=9807\frac{1}{6}(6,4+2\cdot 4,8)9+9807(4,8-4,8\cdot 3)=$$

$$=9807\cdot 24-9807\cdot 9,6=141220,8$$

Massasi m - ga, tezligi v -ga teng bo'lgan moddiy nuqtaning kinetik energiyasi deb $k=\frac{mv^2}{2}$

kattalikka aytiladi. Massalari $m_1, m_2, ...m_n$, tezliklari mos ravishda $v_1, v_1, ...v_n$, larga teng bo'lgan n ta moddiy nuqtalar sistemasining kinetik energiyasi

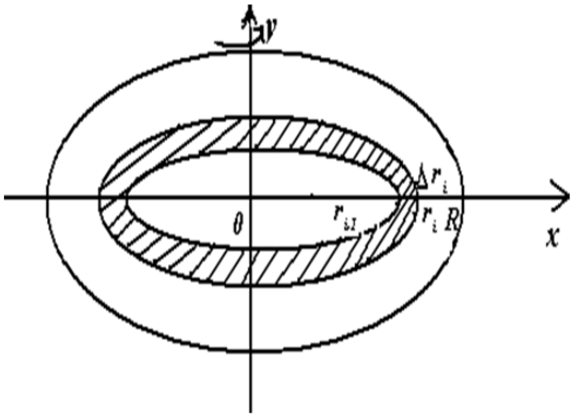
$$K=\sum_{i=1}^{n}\frac{m_i v_i^2}{2}$$

ga tengdir.

Moddiy jism (figura)ning kinetik energiysini ham yuqorida qaralgan masalalarni yechishda foydalanilgan usuldan foydalanib topamiz, ya'ni berilgan jismni n ta kichik (elementar) qismlarga ajratib ularni moddiy nuqtalar sistemasi deb qaraymiz va ularni kinetik energiyalarini jamlab qandaydir funksiyaning integral yig'indisiga ega bo'lamiz. Unda limitga o'tib, qiymati jismning izlanayotgan kinetik energiyasiga teng bo'lgan aniq integralni hosil qilamiz.

1- misol. Massasi M va radiusi R bo'lgan disk uning markazidan disk tekisligiga perpendikulyar bo'lib o'tgan o'q atrofida ω burchak tezlik bilan aylanyapti. Uning kinetik energiyasini hisoblang.

Yechish. Diskni radiuslari $0 < r_1 < r_2 < r_3 < \ldots < r_{i-1} < r_i < \ldots < r_n = R$ bo'lgan aylanalar yordamida n ta ixtiyoriy halqalarga ajratamiz. Qalinligi (kengligi) $\Delta r_i = r_i - r_{i-1}$ $(i = \overline{1, n})$ bo'lgan halqani qaraymiz. Bu halqaning massasi



3-chizma

$$\Delta m_i = \rho \Delta S_i = \rho\pi(r_i^2 - r_{i-1}{}^2) = \rho\pi(r_i + r_{i-1})(r_i - r_{i-1}) =$$
$$= 2\rho\pi \frac{(r_i + r_{i-1})}{2} \Delta r_i = 2\rho\pi r_i \Delta r_i$$

Bunda $\rho = \dfrac{M}{\pi R^2}$ -diskning zichligi, r_i esa $[r_i; r_{i-1}]$ kesmaning o'rtasi. U holda

$$\Delta m_i = 2\frac{M}{\pi R^2}\pi r_i \Delta r_i = \frac{2Mr_i}{R^2}\Delta r_i$$

Δm_i massaning chiziqli tezligi $v_i = r_i\omega$ ga teng. Demak elementar kinetik energiya quyidagiga teng bo'ladi:

$$\Delta K_i = \frac{\Delta m_i v_i^2}{2} = \frac{(r_i\omega)^2}{2} \cdot \frac{2Mr_i}{R^2}\Delta r_i = \frac{\omega^2 M}{R^2} r_i^3 \Delta r_i$$

Barcha elementar kinetik energiyalarni jamlab

$$K \approx \sum_{i=1}^{n} \frac{\omega^2 M}{R^2} r_i^3 \Delta r_i = \frac{\omega^2 M}{R^2} \sum_{i=1}^{n} r_i^3 \Delta r_i$$

ga ega bo'lamiz. Bunda $\max \Delta r_i \to 0$ da limitga o'tsak

$$K = \frac{\omega^2 M}{R^2}\int_0^R r^3 dr = \frac{\omega^2 M}{R^2}\frac{r^4}{4}\Big|_0^R = \frac{\omega^2 M R^2}{4}$$ hosil bo'ladi.

Xulosa

o'rnida shuni aytish lozimki, aniq integrallar matematik hisoblashlarda katta amaliy ahamiyatga ega. Bu atrofimizdagi dunyoga hech qanday aloqasi bo'lmagan mavhum matematika emas. Ko'pgina haqiqiy tabiiy jarayonlar aniq integrallar yordamida hisoblangan [1-24]. Aniq integrallar biologiya, kimyo, iqtisod va boshqa ko'plab fanlarda ham keng qo'llaniladi .

Foydalanilgan adabiyotlar

1. Abdukadirovich, S. U., & Abduganievich, D. U. (2020). ABOUT THE ISSUES OF GEOMETRICAL INEQUALITIES AND THE METHODS OF THEIR SOLUTION. *European science*, (7 (56)), 5-10.
2. Abdukadirovich, S. U., & Abduganievich, D. U. (2021, June). ON SOME PROBLEMS OF EXTREME PROPERTIES OF THE FUNCTION AND THE APPLICATION OF THE DERIVATIVE AND METHODS FOR THEIR SOLUTION. In Archive of Conferences (pp. 113-117).
3. Soatov, U. A. (2018). Djonuzoqov. UA" Problems of geometry with the help of joint application of basic theorems and formulas". Scientific-methodical journal of" Physics, Mathematics and Informatics",(4), 40.
4. Abdukadirovich, S. U., & Abduganievich, D. U. (2022). ABOUT THE METHODS OF SOLVING PARAMETRIC EQUATIONS. Journal of Academic Research and Trends in Educational Sciences, 1(5), 1-7.
5. Abdug'aniyevich, D. U. B. (2022). PARAMETRLI LOGARIFMIK TENGLAMALARNI YECHISH USULLARIGA OID BA'ZI MASALALAR. PEDAGOGS jurnali, 5(1), 8-16.
6. Djonuzaqov, S. U. (2019). Irratsional tenglama va tengsizliklarni yechish metodlarining tatbiqlari haqida. Scientific-methodical journal of" Physics, Mathematics and Informatics, 4, 8-16.
7. Djonuzaqov, S. U. (2019). Tenglamalar sistemalarini tuzish va ularni yechishga oid ba'zi masalalar haqida. Scientific-methodical journal of" Physics, Mathematics and Informatics, (1.13-20).
8. Soatov, U. A. (2022). Tenglamalarni yechishning grafik usuli haqida. Science and Education, 3(8), 7-12.
9. Abdukadirovich, S. U., & Abduganievich, D. U. (2023). Using Real World Problems in Developing Students' Mathematical Skills. Eurasian Journal of Physics, Chemistry and Mathematics, 14, 10-15.
10. Abdukadirovich, S. U., & Abdug'oniyevich, D. U. B. (2022, November). ABOUT THE METHODS OF SOLVING GEOMETRIC PROBLEMS AT THE SCHOOL LEVEL. In E Conference Zone (pp. 49-56).
11. Soatov, U. A. (2022). Logarfmik funksiya qatnashgan murakkab tenglamalarni yechish usullari haqida. Science and Education, 3(9), 16-22.
12. Abdukadirovich, S. U., & Abdug'oniyevich, D. U. B. (2023). GEOMETRIK MASALALARNI YECHISHDA ASOSIY TUSHUNCHALARNI BIRGALIKDA QO'LLASH. Conferencea, 45-50.
13. Соатов, У. А., & Джанизоков, У. А. (2023). О НЕКОТОРЫХ СПОСОБАХ РЕШЕНИЯ ЗАДАЧ С ПАРАМЕТРАМИ. Экономика и социум, (1-1 (104)), 411-415.
14. Abduganievich, D. U., & Rajabovich, G. R. (2023). PARAMETRIC LINEAR EQUATIONS AND METHODS FOR THEIR SOLUTION. Open Access Repository, 4(2), 780-787.
15. Джанизоков У.А. (2024). О ПРИЛОЖЕНИЯХ ДИФФЕРЕНЦИАЛЬНОГО ИСЧИСЛЕНИЯ. Экономика и социум, (4-1 (119)), 851-854.
16. Djanizoqov U.A. (2024). PARAMETRLI KVADRAT TENGLAMALARNI YECHISHNING GRAFIK USULI. Экономика и социум, (6-1 (121)), 179-182.
17. Соатов У.А. , & Джонизаков У.А. (2024). О СОСТАВЛЕНИИ И МЕТОДАХ РЕШЕНИЯ ДИФФЕРЕНЦИАЛЬНЫХ УРАВНЕНИЙ ПРИ РЕШЕНИИ ПРАКТИЧЕСКИХ ЗАДАЧ. Экономика и социум, (2-2 (117)), 656-659.
18. Соатов У.А. , & Джонизаков У.А. (2024). О МЕТОДАХ РЕШЕНИЯ НЕЛИНЕЙНЫХ СИСТЕМ УРАВНЕНИЙ. Экономика и социум, (2-2 (117)), 660-664.

19. Джонизаков Улугбек Абдуганиевич, & Буриев Фазлиддин Абдужабборович. (2024). ПРИЛОЖЕНИЕ ДЛЯ ПРИБЛИЖЕННОГО ВЫЧИСЛЕНИЯ РЯДОВ. Uzbek Scholar Journal, 28, 68–71.
20. Djanizoqov Ulug'bek Abdug'oniyevich, & Amonov Jonibek Suyunboyevich. (2024). JISMNING UZOQLASHISH TEZLIGINI HISOBLASHDA ANIQ INTEGRALDAN FOYDALANISH. Uzbek Scholar Journal, 28, 72–75.
21. Djanizoqov Ulug'bek Abdug'oniyevich, & Asatulloyev Javohir Sanjarovich. (2024). QATORLARNI ANIQ INTEGRALLARNI HISOBLASHGA TADBIQI. Uzbek Scholar Journal, 28, 76–79.
22. Djanizoqov, U. A., & Axmatov, J. J. (2024). ELEKTROTEXNIKA MASALALARIDA DIFFERENSIAL TENGLAMALARNINGQO'LLANILISHI. Экономика и социум, (3-1 (118)), 114-117.
23. Джанизоков, У. А., & Гадаев, Р. Р. (2023). ИСПОЛЬЗОВАНИЕ СВОЙСТВ ФУНКЦИЙ ПРИ РЕШЕНИИ НЕСТАНДАРТНЫХ ЗАДАЧ. Экономика и социум, (4-1 (107)), 563-567.
24. Muxtorov, S. (2023). FUNKSIYANING MONOTONLIK XOSSALARINING QO'LLANILISHI. Research and implementation.