

**60540200-Amaliy matematika mutaxassisligi 2-kurs talabalari uchun**  
**«Matematik analiz» fanidan murakkablik darajasi bo'yicha tuzilgan yakuniy**  
**baholash savollari**  
**(2024-2025 o'quv yili 3-semestr)**

**Nazariy savollar**

1. Funksional ketma-ketlik va qatorlarning yaqinlashuvchiligi.
2. Funksional ketma-ketlikning tekis yaqinlashuvchiligi. Koshi kriteriyasi.
3. Tekis yaqinlashuvchi funksional ketma-ketliklarning xossalari.
4. Funksional qatorlar va ularning yaqinlashuvchiligi.
5. Funksional qatorning yaqinlashish sohasi. Funksional qatorning qisman yig'indilari.
6. Absolyut yaqinlashuvchi funksional qatorlar
7. Funksional qatorning tekis yaqinlashuvchiligi. Koshi kriteriyasi.
8. Tekis yaqinlashuvchi funksional qatorning zaruriy va yetarli shartlari.
9. Funksional qatorning yaqinlashuvchiligining Veyershtass alomati. Koshi teoremasi.
10. Tekis yaqinlashuvchi funksional qatorlarning xossalari.
11. Funksional qator yig'indisining uzluksizligi.
12. Funksional qatorlarda hadlab limitga o'tish.
13. Funksional qatorni hadlab integrallash.
14. Funksional qatorni hadlab differensiallash.
15. Funksional ketma-ketliklar va qatorlarning tekis yaqinlashish alomatlari (Abel, Veyershtass, Dirixle, Dini)
16. Darajali qatorlar. Abel teoremasi. Koshi-Adamar teoremasi.
17. Darajali qatorning yaqinlashish radiusi, intervali va sohasi.
18. Darajali qatorlarning funksional xossalari. Leybnis teoremasi.
19. Teylor qatori. Ba'zi bir elementar funksiyalarni darajali qatorlarga yoyish.
20. Karrali integrallar. Ikki karrali integral ta'riflari. Darbu yig'indilari.
21. Ikki karrali integralning mavjudligi. Integrallanuvchi funksiyalar sinfi.
22. Ikki karrali integralning xossalari. Ikki karrali integrallarni hisoblash.
23. Ikki karrali integralda o'rta qiymat haqida umumlashgan teorema.
24. Ikki karrali integrallarda o'zgaruvchilarni almashtirish.
25. Uch karrali integralning mavjudligi. Integrallanuvchi funksiyalar sinfi.
26. Uch karrali integralning xossalari. Uch karrali integrallarni hisoblash.
27. Uch karrali integralda o'rta qiymat haqida umumlashgan teorema.
28. Uch karrali integrallarda o'zgaruvchilarni almashtirish.
29. Egri chiziqli integrallar. Birinchi tur egri chiziqli integrallar.
30. Egri chiziqli integral ta'rifi. Integralning mavjudligi.
31. Birinchi tur egri chiziqli integralni hisoblash.
32. Egri chiziqli integralning ba'zi bir tatbiqlari.
33. Egri chiziqli integrallar. Ikkinchi tur egri chiziqli integrallar.
34. Ikkinchi tur egri chiziqli integralning xossalari.
35. Birinchi tur egri chiziqli integralning xossalari.
36. Ikkinchi tur egri chiziqli integralni hisoblash.
37. Grin formulasi. Grin formulasining tatbiqlari.
38. Davriy funksiyalar. Funksiyalarni davriy davom ettirish. Fure qatori.
39. Juft va toq funksiyalarning Fure qatori. Dirixle integrali.
40. Lokalizatsiyalash prinsipi. Fure qatorining yaqinlashuvchiligi.

### Amaliy ahamiyatga ega savollar

41. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:  $f_n(x) = n \sin \frac{\sqrt{x}}{n}$   
B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:  
$$f_n(x) = \frac{nx}{1+n+x}, \quad (0 \leq x \leq 1)$$
  
C) Quyidagi limitni toping:  $\lim_{x \rightarrow \frac{1}{2}} \sum_{n=1}^{\infty} x^{n-1}$
42. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:  $f_n(x) = x^n$   
B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:  
$$f_n(x) = \frac{nx}{1+n^2x^2}, \quad (0 \leq x \leq 1)$$
  
C) Quyidagi limitni toping:  $\lim_{x \rightarrow 1-0} \sum_{n=1}^{\infty} (x^{n+1} - x)$
43. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:  
$$f_n(x) = \left( \frac{x+n}{2x+n} \right)^{2(x+n)}$$
  
B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:  
$$f_n(x) = \sqrt{x^2 + \frac{1}{n^2}}, \quad (x \in \mathbb{R})$$
  
C) Quyidagi limitni toping:  $\lim_{x \rightarrow 1-0} \sum_{n=1}^{\infty} \frac{(-1)^{n-1} x^n}{2^{n-1}}$
44. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:  
$$f_n(x) = n^2 (\sqrt[n]{x} - \sqrt[n+1]{x}), \quad (x > 0)$$
  
B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:  
$$f_n(x) = \frac{nx + x^2 + n^2}{x^2 + n^2}, \quad (0 \leq x \leq 1)$$
  
C) Quyidagi limitni toping:  $\lim_{x \rightarrow \frac{\pi}{2}} \sum_{n=1}^{\infty} \left( \frac{\sin nx}{\sqrt{n}} - \frac{\sin(n+1)x}{\sqrt{n+1}} \right)$
45. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:  
$$f_n(x) = \frac{1}{x^2 + n}, \quad x \in \mathbb{R}$$
  
B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:  
$$f_n(x) = nx^n(1-x), \quad (0 \leq x \leq 1)$$
  
C) Quyidagi limitni toping:  $\lim_{x \rightarrow +0} \sum_{n=1}^{\infty} \frac{1}{2^n n^x}$
46. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:  
$$f_n(x) = x^n - x^{2n}, \quad 0 \leq x \leq 1$$
  
B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:  
$$f_n(x) = x^n - x^{n+1}, \quad (0 \leq x \leq 1)$$
  
C) Quyidagi limitni toping:  $\lim_{x \rightarrow \infty} \sum_{n=1}^{\infty} \frac{x^2}{1+n^2x^2}$
47. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:

$$f_n(x) = nx^2 \sin \frac{x}{n}, \quad x \in \mathbb{R}$$

B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:

$$f_n(x) = \frac{nx^2}{n+x}, \quad (1 \leq x < +\infty)$$

C) Quyidagi limitni toping:  $\lim_{x \rightarrow \infty} \sum_{n=1}^{\infty} \frac{\cos nx}{n^3}$

48. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:

$$f_n(x) = n(\ln(x+n) - \ln n)$$

B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:

$$f_n(x) = xe^{-nx}, \quad (0 \leq x < +\infty)$$

C) Quyidagi limitni toping:  $\lim_{x \rightarrow \infty} \sum_{n=1}^{\infty} \frac{e^{-nx}}{1+n^2}$

49. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:

$$f_n(x) = \cos^n \frac{x}{\sqrt{n}}, \quad x \in \mathbb{R}$$

B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:

$$f_n(x) = e^{-(x-n)^2}, \quad (-1 \leq x \leq 1)$$

C) Quyidagi limitni toping:  $\lim_{x \rightarrow 1} \sum_{n=1}^{\infty} \left( x^{\frac{1}{2n-1}} - x^{\frac{1}{2n+1}} \right)$

50. A) Quyidagi funksional ketma-ketlikning limit funksiyasini toping:

$$f_n(x) = (x-1) \arctg x^n, \quad 0 < x < +\infty$$

B) Quyidagi funksional ketma-ketlikni tekis yaqinlashuvchilikka tekshiring:

$$f_n(x) = \ln \left( x^2 + \frac{1}{n} \right), \quad (1 \leq x < +\infty)$$

C) Quyidagi limitni toping:  $\lim_{x \rightarrow 1} \sum_{n=1}^{\infty} (\arctg nx - \arctg (n-1)x)$

51. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} \frac{x^n}{2^{\sqrt{n}}}$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} \frac{1}{2n+1} \left( \frac{1-x}{1+x} \right)^n$

C) Quyidagi tenglikni isbotlang:  $\sum_{n=0}^{\infty} \frac{(-1)^n x^{n+1}}{n+1} = \ln(1+x), \quad (x \in \mathbb{R})$

52. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} \frac{x^n}{(n+1)5^n}$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} \frac{\ln^n x}{n}$

C) Quyidagi tenglikni isbotlang:  $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{2n+1} = \frac{\pi}{4}, \quad (x \in \mathbb{R})$

53. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} \frac{n^2}{(n+1)^2} \cdot \frac{x^{2n}}{2^n}$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} \left(1 + \frac{1}{n}\right)^{-n^2} e^{-nx}$

C) Quyidagi tenglikni isbotlang:  $\sum_{n=0}^{\infty} \frac{\ln^n a}{n!} x^n = a^x, (a > 0)$

54. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} \frac{x^n}{n}$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} 2^n \cos^n x$

C) Quyidagi tenglikni isbotlang:  $\sum_{n=0}^{\infty} \frac{x^{2n+1}}{(2n+1)!} = \operatorname{sh} x, (x \in \mathbb{R})$

55. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} n! x^n$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} \frac{1}{x^n} \sin \frac{\pi}{2^n}$

C) Quyidagi tenglikni isbotlang:  $1 + \sum_{n=1}^{\infty} \frac{(2n-1)!!}{(2n)!!} x^{2n} = \frac{1}{\sqrt{1-x^2}}, (-1 < x < 1)$

56. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} (-2)^n \cdot x^{2n}$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} \frac{x^n}{2^{n^2}}$

C) Quyidagi tenglikni isbotlang:  $x + \sum_{n=1}^{\infty} \frac{(2n-1)!!}{(2n)!!} \cdot \frac{x^{2n+1}}{2n+1} = \arcsin x, (-1 < x < 1)$

57. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} n! x^n$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} \frac{3^{3n} (n!)^3}{(3n)!} \operatorname{tg}^n x$

C) Quyidagi tenglikni isbotlang:

$$x + \sum_{n=1}^{\infty} \frac{(-1)^n (2n-1)!!}{(2n)!!} \cdot \frac{x^{2n+1}}{2n+1} = \ln \left( x + \sqrt{x^2 + 1} \right), (-1 < x < 1)$$

58. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} \frac{3^n + (-2)^n}{n} (x+1)^n$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} \left( \frac{x}{\sin n} \right)^n$

C) Quyidagi tenglikni isbotlang:  $\sum_{n=1}^{\infty} \frac{2x^{2n-1}}{2n-1} = \ln \frac{1+x}{1-x}, (-1 < x < 1)$

59. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} (\sqrt[n]{2} - 1) x^n$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:

$$\sum_{n=1}^{\infty} \left( \frac{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)}{2 \cdot 4 \cdot 6 \cdot \dots \cdot (2n)} \right)^p \left( \frac{x-1}{2} \right)^n$$

C) Quyidagi tenglikni isbotlang:  $\sum_{n=0}^{\infty} \frac{x^{2n}}{(2n)!} = \cosh x, (x \in \mathbb{R})$

60. A) Quyidagi darajali qatorning yaqinlashish radiusi, intervali va sohasini toping:

$$\sum_{n=1}^{\infty} \frac{1}{2^n + 3^n} x^n$$

B) Quyidagi darajali qatorning yaqinlashish sohasini toping:  $\sum_{n=1}^{\infty} (-1)^n \left( \frac{2^n (n!)^2}{(2n+1)!} \right)^p \cdot x^n$

C) Quyidagi tenglikni isbotlang:  $\sum_{n=0}^{\infty} \frac{(-1)^n 2^{2n+1}}{(2n+1)!} x^{2n+1} = \sin 2x, (x \in \mathbb{R})$

61. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = e^x, (x \in \mathbb{R})$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \sqrt[3]{130}$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=0}^{\infty} \frac{(-1)^n \ln^n x}{2^n n!}$

62. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = \sin x, (x \in \mathbb{R})$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \sqrt[5]{250}$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=0}^{\infty} (2n+1) x^n$

63. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = \cos x, (x \in \mathbb{R})$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \sin 88^\circ$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=0}^{\infty} \frac{(3n+1)}{n!} x^{3n}$

64. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = \ln(1+x), (-1 < x < 1)$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \operatorname{tg} 44^\circ$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=1}^{\infty} \frac{x^n}{n(n+1)}$

65. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = (1+x)^m, (|x| < 1)$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \ln 3$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=1}^{\infty} n^4 x^n$

66. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = chx, (x \in \mathbb{R})$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \frac{1}{e}$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=1}^{\infty} \frac{\sin nx}{n!}$

67. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = shx, (x \in \mathbb{R})$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \arctg 0.2$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=1}^{\infty} \frac{x^{4n-3}}{4n-3}$

68. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = thx, (x \in \mathbb{R})$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \sqrt[3]{65}$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{(2n-1)3^{n-1}}$

69. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = \ln \frac{1+x}{1-x}, (-1 < x < 1)$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \frac{1}{e^2}$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=1}^{\infty} \frac{2n-1}{2^n}$

70. A) Quyidagi funktsiyani  $x$  ning darajalari bo'yicha qatorga yoying:

$$f(x) = \arccos x, (x \in \mathbb{R})$$

B) Quyidagi  $\alpha$  miqdorni  $\varepsilon = 0.0001$  aniqlikda taqribiy hisoblang:  $\alpha = \arcsin 0.9$

C) Quyidagi darajali qatorning yig'indisini toping:  $\sum_{n=0}^{\infty} \frac{x^{4n}}{(4n)!}$

71. A) Quyidagi ikki karrali integralni hisoblang:  $\int_0^1 \int_1^2 \frac{1}{(x+y)^2} dx dy$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{(D)} (x^2 + y^2) dx dy, (D) = \{(x, y) \in \mathbb{R}^2 : 1 \leq xy \leq 2, 0 \leq x \leq 2y \leq 4x\}$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} xy^2 z^3 dx dy dz, (V) = \{(x, y, z) \in \mathbb{R}^3 : z = xy, y = x, x = 1, z = 0\}$$

72. A) Quyidagi ikki karrali integralni hisoblang:  $\int_0^4 \int_y^2 (3x^2 - 2xy + y) dx dy$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{x^2+y^2 \leq 1} f(\sqrt{x^2+y^2}) dx dy$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \left( \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} \right) dx dy dz, (V) = \left\{ (x, y, z) \in \mathbb{R}^3 : \frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1 \right\}$$

73. A) Quyidagi ikki karrali integralni hisoblang:  $\int_0^{2\pi} \int_1^{2+\sin x} \frac{y}{2} dx dy$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{\pi^2 \leq x^2 + y^2 \leq 4\pi^2} \sin \sqrt{x^2 + y^2} dx dy$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \frac{dx dy dz}{(1+x+y+z)^3}, (V) = \{(x, y, z) \in \mathbb{R}^3 : x+y+z=1, x=0, y=0, z=0\}$$

74. A) Quyidagi ikki karrali integralni hisoblang:  $\int_0^1 \int_{\sqrt{y}}^{2-y} x dx dy$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{(D)} \left( 1 - \left( \frac{x}{a} \right)^{\frac{3}{2}} - \left( \frac{y}{b} \right)^3 \right) dx dy, (D) = \left\{ (x, y) \in \mathbb{R}^2 : x \geq 0, y \geq 0, \left( \frac{x}{a} \right)^{\frac{3}{2}} - \left( \frac{y}{b} \right)^3 \leq 1 \right\}$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \sqrt{x^2 + y^2} dx dy dz, (V) = \{(x, y, z) \in \mathbb{R}^3 : x^2 + y^2 = z^2, z=1\}$$

75. A) Quyidagi ikki karrali integralni hisoblang:  $\int_{-2}^{-1} \int_1^{3+x} \frac{\ln y}{y(x+3)} dx dy$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{\substack{0 \leq x \leq \pi \\ 0 \leq y \leq \pi}} |\cos(x+y)| dx dy$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \sqrt{x^2 + z^2} dx dy dz, (V) = \{(x, y, z) \in \mathbb{R}^3 : x^2 + z^2 = y^2, y=1\}$$

76. A) Quyidagi uch karrali integralni hisoblang:  $\int_0^2 \int_0^1 \int_1^3 (2x+3y-z^3) dx dy dz$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{x^2 \leq y \leq 4} \sqrt{|y-x^2|} dx dy$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \sqrt{y^2 + z^2} dx dy dz, (V) = \{(x, y, z) \in \mathbb{R}^3 : y^2 + z^2 = x^2, x=1\}$$

77. A) Quyidagi uch karrali integralni hisoblang:  $\int_0^2 \int_1^x \int_0^1 x y e^z dx dy dz$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = 4 \iint_{\substack{x^2 + y^2 \leq 4 \\ x \geq 0, y \geq 0}} \operatorname{sgn}(x^2 - y^2 + 2) dx dy$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \frac{dx dy dz}{(\sqrt{2} + x + y + z)^3}, (V) = \{(x, y, z) \in \mathbb{R}^3 : x+y+z=\sqrt{2}, x=0, y=0, z=0\}$$

78. A) Quyidagi uch karrali integralni hisoblang:  $\int_0^3 \int_0^{2x} \int_0^{\sqrt{xy}} z dx dy dz$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{|x|+|y|\leq 1} (|x|+|y|) dx dy$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \frac{xy}{z} dx dy dz, (V) = \{(x, y, z) \in \mathbb{R}^3 : z = xy, y = x, x = 1, z = 0\}$$

79. A) Quyidagi uch karrali integralni hisoblang:  $\int_0^1 \int_0^y \int_1^{\sqrt{x^2+y^2}} z dx dy dz$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{x^2+y^2\leq 1} \left| \frac{x+y}{\sqrt{2}} - x^2 - y^2 \right| dx dy$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} xy z dx dy dz, (V) = \{(x, y, z) \in \mathbb{R}^3 : z = xy, y = x, x = 1, z = 0\}$$

80. A) Quyidagi uch karrali integralni hisoblang:  $\int_0^1 \int_0^x \int_1^y (1-x-y) dx dy dz$

B) Quyidagi ikki karrali integralni hisoblang:

$$I = \iint_{(D)} \frac{(x+y)^2}{x} dx dy, (D) = \left\{ (x, y) \in \mathbb{R}^2 : 1-x \leq y \leq 3-x, \frac{x}{2} \leq y \leq 2x \right\}$$

C) Quyidagi uch karrali integralni hisoblang:

$$I = \iiint_{(V)} \left( \frac{x^2}{4} + \frac{y^2}{9} + \frac{z^2}{25} \right) dx dy dz, (V) = \left\{ (x, y, z) \in \mathbb{R}^3 : \frac{x^2}{4} + \frac{y^2}{9} + \frac{z^2}{25} = 1 \right\}$$

81. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^4 dy \int_{\frac{5}{4}y}^{\sqrt{9+y^2}} f(x, y) dx$

B) Quyidagi egri chiziqlar bilan chegaralangan tekis shaklning yuzini toping:  
 $x^2 + y^2 = 25$  aylana bilan chegaralangan shakl (doira)

C) Quyidagi integralni hisoblang:  $\int_{(0,1)}^{(1,2)} \frac{2x}{y^3} dx + \frac{y^2 - 3x^2}{y^4} dy$

82. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^1 dx \int_0^{4-x^2} f(x, y) dy$

B) Quyidagi egri chiziqlar bilan chegaralangan tekis shaklning yuzini toping:  
 $x = a \cos^3 t, y = a \sin^3 t$  astroida bilan chegaralangan shakl

C) Quyidagi integralni hisoblang:  $\int_{(0,2)}^{(1,3)} (4xy - 15x^2y) dx + (2x^2 - 5x^3 + 7) dy$

83. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^1 dx \int_0^{x^2+1} f(x, y) dy$

B) Quyidagi egri chiziqlar bilan chegaralangan tekis shaklning yuzini toping:



$x = a(2 \cos t - \cos 2t), y = a(2 \sin t - \sin 2t)$  kardioida bilan chegaralangan shakl

C) Quyidagi integralni hisoblang:  $\int_{(0,0)}^{(1,1)} (4x^3 - 3y^2 + 5y)dx + (5x - 6xy - 4y)dy$

84. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^{\frac{1}{2}} dy \int_y^{\sqrt{y}} f(x, y)dx$

B) Quyidagi egri chiziqlar bilan chegaralangan tekis shaklning yuzini toping:

$(x^2 + y^2)^2 = a^2(x^2 - y^2)$  lemniskata bilan chegaralangan shakl

C) Quyidagi integralni hisoblang:  $\int_{(2,1)}^{(1,2)} \frac{ydx - xdy}{x^2}$

85. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^2 dx \int_0^{3-x} f(x, y)dy$

B) Quyidagi egri chiziqlar bilan chegaralangan tekis shaklning yuzini toping:

$(x+y)^2 = ax, (a > 0)$  parabola hamda  $OX$  o'qi bilan chegaralangan shakl

C) Quyidagi integralni hisoblang:  $\int_{(1,\pi)}^{(2,\pi)} \left(1 - \frac{y^2}{x^2} \cos \frac{y}{x}\right) dx + \left(\sin \frac{y}{x} + \frac{y}{x} \cos \frac{y}{x}\right) dy$

86. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^1 dy \int_0^{2-y} f(x, y)dx$

B) Quyidagi chiziqning yoy uzunligini toping:  $x = \cos^4 t, y = \sin^4 t (0 \leq t \leq 2\pi)$

C) Agar quyidagi ifoda to'liq differensial bo'lsa,  $F(x, y)$  funksiyani toping:

$(x^2 + 2xy - y^2)dx + (x^2 - 2xy - y^2)dy$

87. A) Integrallash ta'rtibini o'zgartiring:  $\int_1^2 dy \int_0^{2y} f(x, y)dx$

B) Quyidagi chiziqning yoy uzunligini toping:  $ay^2 = x^3, 0 \leq x \leq 5a$

C) Agar quyidagi ifoda to'liq differensial bo'lsa,  $F(x, y)$  funksiyani toping:

$(e^{2y} - 5y^3 e^x)dx + (2xe^{2y} - 15y^2 e^x)dy$

88. A) Integrallash ta'rtibini o'zgartiring:  $\int_1^2 dy \int_0^{y^2} f(x, y)dx$

B) Quyidagi chiziqning yoy uzunligini toping:  $y = \frac{a}{2} \left( e^{\frac{x}{a}} + e^{-\frac{x}{a}} \right) (0 \leq x \leq x_0)$

C) Agar quyidagi ifoda to'liq differensial bo'lsa,  $F(x, y)$  funksiyani toping:

$\left(12x^2y + \frac{1}{y^2}\right)dx + \left(4x^3 - \frac{2x}{y^2}\right)dy$

89. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^{\frac{3}{4}} dx \int_{x^2}^x f(x, y)dy$

B) Quyidagi chiziqning yoy uzunligini toping:  $\rho = a \sin^3 \frac{\varphi}{3}$

C) Agar quyidagi ifoda to'liq differensial bo'lsa,  $F(x, y)$  funksiyani toping:

$$(3x^2y^2 - y^3 + 4x)dx + (2x^3y - 3xy^2 + 5)dy$$

90. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^4 dx \int_0^{\sqrt{x}} f(x, y) dy$

B) Quyidagi chiziqning yoy uzunligini toping:  $y = 1 - \ln \cos x \left( 0 \leq x \leq \frac{\pi}{4} \right)$

C) Agar quyidagi ifoda to'liq differensial bo'lsa,  $F(x, y)$  funksiyani toping:

$$\frac{x}{y\sqrt{x^2 + y^2}} dx - \frac{x^2 + \sqrt{x^2 + y^2}}{y^2\sqrt{x^2 + y^2}} dy$$

91. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^4 dx \int_0^{\sqrt{25-x^2}} f(x, y) dy$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K (2x + y)dx + (x - 3y)dy$  bunda  $K$ -uchlari  $(0, 0)$ ,  $(1, 0)$ ,  $(0, 1)$  nuqtalarda bo'lgan uchburchakning konturi.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = x^2, T = 2\pi, (-\pi; \pi]$$

92. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^4 dy \int_{\frac{1}{2}y+1}^{7-y} f(x, y) dx$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K x^2 dy - x^2 y dx$  bunda  $K$ -ushbu  $x^2 + y^2 = r^2$  aylanadan iborat.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = x + |x|, T = 2\pi, (-\pi; \pi]$$

93. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^2 dx \int_{\frac{1}{4}x^2}^{2\sqrt{x}} f(x, y) dy$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K \sqrt{x^2 + y^2} dx + y \left( xy + \ln \left( x + \sqrt{x^2 + y^2} \right) dy \right)$  bunda  $K$ -uchlari  $(3, 2)$ ,  $(6, 2)$ ,  $(6, 4)$ ,  $(3, 4)$

nuqtalarda bo'lgan to'g'ri to'rtburchakning konturi.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = x^3, T = 2\pi, (-\pi; \pi]$$

94. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^4 dy \int_{\frac{3}{2}\sqrt{y}}^{\sqrt{25-y^2}} f(x, y) dx$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K (3x^2 + y)dx + (x - 2y^2)dy = 0$  bunda  $K$ -uchlari  $(0, 0)$ ,  $(1, 0)$ ,  $(0, 1)$  nuqtalarda bo'lgan uchburchakning konturi.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = \pi - x, T = 2\pi, (-\pi; \pi]$$

95. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^1 dy \int_{2y+1}^{4-y^2} f(x, y) dx$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K \frac{dx-dy}{x+y}$  bunda  $K$ -uchlari  $(1,0), (0,1), (-1,0), (0,-1)$  nuqtalarda bo'lgan kvadratning konturi.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = 1 - |x|, T = 6, [-3; 3]$$

96. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^4 dy \int_{\frac{1}{2}y+1}^{\frac{3}{2}y+4} f(x, y) dx$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K 2(x^2 + y^2) dx + (x + y)^2 dy$  bunda  $K$ -uchlari  $(1,1), (2,2), (1,3)$  nuqtalarda bo'lgan uchburchakning konturi.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = 2x, T = 1, (0; 1)$$

97. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^4 dx \int_{1-\frac{1}{2}x}^{3-\frac{1}{2}x^2} f(x, y) dy$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K e^x ((1 - \cos y) dx - (y - \sin y) dy)$  bunda  $K$ -ushbu  $0 \leq x \leq \pi, 0 \leq y \leq \sin x$  sohaning konturidan iborat.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = \begin{cases} 3, & 0 < x \leq 2, \\ 0, & 2 < x < 4, \end{cases} \quad T = 4$$

98. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^3 dx \int_{\sqrt{9-x^2}}^{\sqrt{25-x^2}} f(x, y) dy$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K (xy + x + y) dx + (xy + x - y) dy$  bunda  $K$ -ushbu  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  ellipsdan iborat.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = \begin{cases} 0, & -3 < x \leq 0, \\ x, & 0 < x < 3, \end{cases} \quad T = 6$$

99. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^2 dy \int_{y^2}^{y^2+2} f(x, y) dx$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K (1 - x^2) y dx + x(1 + y^2) dy$  bunda  $K$ -ushbu  $x^2 + y^2 = r^2$  aylanadan iborat.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = \begin{cases} -4, & -\pi < x < 0, \\ 4, & 0 \leq x < \pi, \end{cases} \quad T = 2\pi$$

100. A) Integrallash ta'rtibini o'zgartiring:  $\int_0^2 dx \int_{4-2x^2}^{4-x^2} f(x, y) dy$

B) Quyidagi egri chiziqli integralni hisoblang:

$\oint_K (x+y)^2 dx - (x^2 + y^2) dy$  bunda  $K$ -uchlari  $(1,1), (3,2), (2,5)$  nuqtalarda bo'lgan uchburchakning konturi.

C)  $T$  davrli  $f(x)$  funksiyani berilgan kesmada Fure qatoriga yoying:

$$f(x) = \begin{cases} 0, & -\pi < x < 0, \\ x, & 0 \leq x < \pi, \end{cases} \quad T = 2\pi$$

**Savolnomani tuzgan:**

**Xudaybergenov Tursinbay**