I. Individual Compulsory Homework: Limits and Continuity

Problem 1. Find the limits:

Variant 1

1. $\lim\limits_{x\to\infty}\dfrac{4x^3-2x+4}{2x^3-4x^2+3}$
2. $\lim\limits_{x\to\infty}\dfrac{\sqrt{3x^4+5x-3}+\sqrt[3]{2x^3+5x^2+4}}{\sqrt[4]{7x^3+4x^2+3}-\sqrt{2x^5+7x^4-5}}$
3. $\lim\limits_{x\to 2}\dfrac{x^3-3x-2}{x^3+2x-12}$
4. $\lim\limits_{x\to 0}\dfrac{\sqrt[3]{2+x}-\sqrt[3]{2-x}}{2x^3-7x}$
5. $\lim\limits_{x\to 8}\dfrac{\sqrt{x^2-15}-7}{8+7x-x^2}$
6. $\lim\limits_{x\to 0}\dfrac{2^x-3^x}{\tan 2\pi(x+\frac{1}{2}))}$
7. $\lim\limits_{x\to 0}\dfrac{\cos 7x-1}{x\sin 3x}$
8. $\lim\limits_{x\to 3}\dfrac{\ln(2x-5)}{\tan 3-\tan x}$
9. $\lim\limits_{x\to\frac{\pi}{3}}\dfrac{1-2\cos x}{\sin(\pi-3x)}$
10. $\lim\limits_{x\to\infty}\left(\dfrac{5-x}{11-2x}\right)^{\frac{1+3x^2}{x}}$
11. $\lim\limits_{x\to\infty}\left(\dfrac{5-2x}{11-2x}\right)^{\frac{1+3x^2}{x}}$
12. $\lim\limits_{x\to\infty}\left(\dfrac{5-2x}{11-x}\right)^{\frac{1+3x^2}{x}}$

Variant 2

1. $\lim\limits_{x\to\infty}\dfrac{2x^3-3x^2+5}{4x^3+5x-2}$
2. $\lim\limits_{x\to\infty}\left(\sqrt{3x^2+4x-3}-\sqrt{3x^2-2x+7}\right)$
3. $\lim\limits_{x\to\frac{1}{2}}\dfrac{2x^2-5x+2}{6x^3+7x^2-x-2}$
4. $\lim\limits_{x\to -3}\dfrac{\sqrt[3]{x-5}+2}{-2x^2-5x+3}$
5. $\lim\limits_{x\to 1}\dfrac{\sqrt[4]{x}-1}{1-\sqrt{x}}$
6. $\lim\limits_{x\to 0}\dfrac{\cos^2\pi x-1}{\log_2(1+3x^2)}$
7. $\lim\limits_{x\to 0}\dfrac{e^{2x^2+3x}-1}{2\sin\dfrac{x}{2}}$
8. $\lim\limits_{x\to 2}\dfrac{\ln(7-3x)}{\arctan\left(x^2-2x\right)}$
9. $\lim\limits_{x\to 1}\dfrac{\sin\pi(x+1)}{2-2^{4x-3}}$
10. $\lim\limits_{x\to\infty}\left(\dfrac{3x-7}{3x+1}\right)^{\frac{x+1}{4}}$
11. $\lim\limits_{x\to\infty}\left(\dfrac{x-7}{3x+1}\right)^{\frac{x+1}{4}}$
12. $\lim\limits_{x\to\infty}\left(\dfrac{3x-7}{x+1}\right)^{\frac{x+1}{4}}$

Variant 3

1. $\lim\limits_{x\to\infty}\dfrac{7x^3+5x-3}{2x^3+4x^2+5}$
2. $\lim\limits_{x\to+\infty}\left(\sqrt{x^3+2x+5}-\sqrt{x^3-x+4}\right)\sqrt{x}$
3. $\lim\limits_{x\to -3}\dfrac{x^3+4x^2+3x}{x^2+2x-3}$
4. $\lim\limits_{x\to 8}\dfrac{\sqrt[3]{x^2}-4}{8+7x-x^2}$
5. $\lim\limits_{x\to 3}\dfrac{\sqrt{x+1}-2}{x^2-9}$
6. $\lim\limits_{x\to 0}\dfrac{\log_2(2x+1)}{1-e^{2\pi x}}$
7. $\lim\limits_{x\to 0}\dfrac{\sin 2x-\sin 6x}{\tan\left(\dfrac{3\pi}{2}\left(x^2-3x\right)\right)}$
8. $\lim\limits_{x\to 1}\dfrac{1+\cos 3\pi x}{\tan^2\pi x}$
9. $\lim\limits_{x\to -1}\dfrac{3^{3+2x}-3}{\sin\pi(x+1)}$
10. $\lim\limits_{x\to\infty}\left(\dfrac{4x+2}{x-3}\right)^{\frac{1-x^2}{x+2}}$
11. $\lim\limits_{x\to\infty}\left(\dfrac{4x+2}{4x-3}\right)^{\frac{1-x^2}{x+2}}$
12. $\lim\limits_{x\to\infty}\left(\dfrac{x+2}{4x-3}\right)^{\frac{1-x^2}{x+2}}$

Variant 4.

1. $\lim\limits_{x\to\infty}\dfrac{3x^2-5x+14}{3x^4+2x^2-3}$
2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[5]{6x^3+5x+3}+\sqrt[3]{x^4+6x^2-3}}{\sqrt{x^3-5x+3}+\sqrt[6]{x^2-4x+5}}$
3. $\lim\limits_{x\to 2}\dfrac{x^3-3x^2+4}{x^2+2x-8}$
4. $\lim\limits_{x\to 2}\dfrac{\sqrt[3]{4x}-2}{2x-x^2}$
5. $\lim\limits_{x\to 5}\dfrac{\sqrt{x-1}-2}{x^2-8x+15}$
6. $\lim\limits_{x\to 0}\dfrac{\cos\pi x-\cos 3\pi x}{\arctan 5x^2}$
7. $\lim\limits_{x\to 0}\dfrac{2^{-5x}-1}{\ln(1-\pi x)}$
8. $\lim\limits_{x\to 4}\dfrac{3^x-81}{\sin\pi\left(x+3\right)}$
9. $\lim\limits_{x\to\pi}\dfrac{e^{2\pi}-e^{\pi+x}}{\tan 2x}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{1+4x}{2+4x}\right)^{\frac{2+4x^2}{3x}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{1+x}{2+4x}\right)^{\frac{2+4x^2}{3x}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{1+4x}{2+x}\right)^{\frac{2+4x^2}{3x}}$

Variant 5.

1. $\lim\limits_{x\to\infty}\dfrac{6x^3+18x-3}{3x^3+5x+10}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[4]{12x^5+5x-3}+\sqrt[3]{x^2-3x+2}}{\sqrt[5]{5x^3-4x+3}+\sqrt[5]{x^6+5x-3}}$ 3. $\lim\limits_{x\to2}\dfrac{x^3-3x-2}{x^3-6x^2+12x-8}$

4. $\lim\limits_{x\to0}\dfrac{\sqrt{9+2x}-3}{x+2\sqrt[5]{x^7}}$ 5. $\lim\limits_{x\to-8}\dfrac{2+\sqrt[3]{x}}{3-\sqrt{1-x}}$ 6. $\lim\limits_{x\to0}\dfrac{5^{-2x}-1}{\arctan(4x-x^2)}$

7. $\lim\limits_{x\to0}\dfrac{1-\cos^3\sqrt{x}}{\ln(1+5x)}$ 8. $\lim\limits_{x\to2}\dfrac{\tan2\pi x}{4-x^2}$ 9. $\lim\limits_{x\to0}\dfrac{\sin(x-2)-\sin(x+2)}{e^{2x}-e^{3x}}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+x^2}{1+x+2x^2}\right)^{\frac{3x^3}{x^2-4}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+2x^2}{1+x+2x^2}\right)^{\frac{3x^3}{x^2-4}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+x^2}{1+x+x^2}\right)^{\frac{3x^3}{x^2-4}}$

Variant 6.

1. $\lim\limits_{x\to\infty}\dfrac{7x^2-14x+12}{13x^4+7x-3}$ 2. $\lim\limits_{x\to\infty}\left(\sqrt{2x^2+5x-3}-\sqrt{2x^2-3x}\right)$ 3. $\lim\limits_{x\to2}\dfrac{x^3-3x^2+4}{x^2-4x+4}$

4. $\lim\limits_{x\to0}\dfrac{\sqrt[4]{x+1}-1}{x^3-4x}$ 5. $\lim\limits_{x\to7}\dfrac{4-\sqrt[3]{x^2+15}}{\sqrt{x+2}-3}$ 6. $\lim\limits_{x\to0}\dfrac{\log_2(1-2x)}{\cos\sqrt{x}-1}$

7. $\lim\limits_{x\to0}\dfrac{4-4^{2x+1}}{\sin3x}$ 8. $\lim\limits_{x\to2}\dfrac{\tan\frac{x}{2}-\tan1}{2\arctan(3x-6)}$ 9. $\lim\limits_{x\to1}\dfrac{e-e^x}{\left(x^2+1\right)\sin\left(x^2-1\right)}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{x^3-2}{4x^3+2}\right)^{\frac{x^2+2}{3}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{4x^3-2}{x^3+2}\right)^{\frac{x^2+2}{3}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{4x^3-2}{4x^3+2}\right)^{\frac{x^2+2}{3}}$

Variant 7.

1. $\lim\limits_{x\to\infty}\dfrac{12x^3+7x^2-2}{6x^3+5x+100}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt{x^5+4x^3-5}+\sqrt[3]{3x^4+5x-3}}{\sqrt[4]{7x^{10}+x+10}-\sqrt[6]{x^2+x+2}}$ 3. $\lim\limits_{x\to2}\dfrac{x^3-6x^2+12x-8}{x^3-3x^2+4}$

4. $\lim\limits_{x\to1}\dfrac{\sqrt[4]{15+x}-2}{x^3-2x^2+1}$ 5. $\lim\limits_{x\to0}\dfrac{\sqrt[3]{x+2}+\sqrt[3]{x-2}}{\sqrt{9-x}-3}$ 6. $\lim\limits_{x\to0}\dfrac{2^{x^2-x+1}-2}{\log_3(1-2x)}$

7. $\lim\limits_{x\to0}\dfrac{\cos^3x-\cos^2x}{\cos3x-\cos x}$ 8. $\lim\limits_{x\to-\frac{\pi}{6}}\dfrac{8\sin^3x+1}{6x+\pi}$ 9. $\lim\limits_{x\to4}\dfrac{\tan\pi x}{4x-x^2}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{7x^2-5x+4}{3+2x+7x^2}\right)^{\frac{x+2}{3}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{7x^2-5x+4}{3+2x+x^2}\right)^{\frac{x+2}{3}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-5x+4}{3+2x+7x^2}\right)^{\frac{x+2}{3}}$

Variant 8.

1. $\lim\limits_{x\to\infty}\dfrac{6x^2+7x+2}{8x^2-2x+5}$ 2. $\lim\limits_{x\to\infty}\left(\sqrt{7x^2+5x-4}-\sqrt{7x^2-x+6}\right)$ 3. $\lim\limits_{x\to-1}\dfrac{x^3+4x^2+5x+2}{x^3-7x^2-5x+3}$

4. $\lim\limits_{x\to2}\dfrac{1-\sqrt{7-3x}}{\sqrt[3]{x^2+4}+2\sqrt[3]{7-2x^2}}$ 5. $\lim\limits_{x\to0}\dfrac{3^{-x+2}-9}{4\arctan\frac{x}{2}}$ 6. $\lim\limits_{x\to0}\dfrac{x^2+8x}{\sqrt{25-x^3}-5}$

7. $\lim\limits_{x\to0}\dfrac{\log_{10}(x+10)-1}{\sin3x-\sin5x}$ 8. $\lim\limits_{x\to-1}\dfrac{\cos4x-\cos4}{\sin4x+\sin4}$ 9. $\lim\limits_{x\to2}\dfrac{\left(4x^2-3\right)\sin\left(4-x^2\right)}{e^{\sin\pi x}-e^{\tan\pi x}}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{2+3x^2-x^3}{3-x^2-x^3}\right)^{\frac{x-1}{3}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{2+3x^2-4x^3}{3-x^2-x^3}\right)^{\frac{x-1}{3}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{2+3x^2-4x^3}{3-x^2-6x^3}\right)^{\frac{x-1}{3}}$

Variant 9.

1. $\lim\limits_{x\to\infty}\dfrac{7x^2-5x+4}{3x^4+2x-2}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt{3x^2+4x-2}+\sqrt[5]{x^3-4x+3}}{\sqrt[3]{7x^3+5x+4}+\sqrt{x+5}}$ 3. $\lim\limits_{x\to3}\dfrac{x^3-10x+3}{2x^3-7x^2+9}$.

4. $\lim\limits_{x\to1}\dfrac{\sqrt{5-x}-\sqrt[3]{7x+1}}{\sqrt{x+1}-\sqrt{3x^2-1}}$ 5. $\lim\limits_{x\to2}\dfrac{\left(x\sqrt{x+2}-x^2\right)}{\sin(2-x)}$; 6. $\lim\limits_{x\to0}\dfrac{2^x+5^x-2}{\log_3(1+10x)}$.

7. $\lim\limits_{x\to0}\dfrac{\cos\left(x+x^2\right)-1}{\sin 3x^2}$; 8. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\tan 8x}{\cos\left(x+\frac{\pi}{4}\right)}$. 9. $\lim\limits_{x\to\frac{\pi}{3}}\dfrac{8\cos^3 x-1}{\frac{x}{2}-\frac{\pi}{6}}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{3-2x^3}{5-2x^3}\right)^{\frac{2x^3+1}{4}}$; 11. $\lim\limits_{x\to\infty}\left(\dfrac{3-2x^3}{5-x^3}\right)^{\frac{2x^3+1}{4}}$; 12. $\lim\limits_{x\to\infty}\left(\dfrac{3-x^3}{5-2x^3}\right)^{\frac{2x^3+1}{4}}$.

Variant 10.

1. $\lim\limits_{x\to\infty}\dfrac{12x^3+4x-7}{5x^2+6x+3}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt{5x^2+4x-2}-\sqrt{x^5+3x^2+2}}{\sqrt[3]{x^7-14x^5+10}+\sqrt[7]{x^2-x-2}}$ 3. $\lim\limits_{x\to-2}\dfrac{x^3+5x^2+8x+4}{2x^3+3x^2-7x-10}$.

4. $\lim\limits_{x\to-2}\dfrac{\sqrt[3]{4x^2-15}-1}{\sqrt{x+3}-1}$. 5. $\lim\limits_{x\to0}\dfrac{\sqrt{3x+2}-\sqrt{x+2}}{4^x+5^x-2}$; 6. $\lim\limits_{x\to0}\dfrac{\log_2\left(16-x^2\right)-2\log_3 9}{3\arctan\left(x^2-3x\right)}$;

7. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\cot x-1}{\sqrt[3]{\cos 2x}}$. 8. $\lim\limits_{x\to2}\dfrac{\sin\sqrt{x}-\sin\sqrt{2}}{2x-4}$. 9. $\lim\limits_{x\to\frac{\pi}{2}}\dfrac{\cos 5x}{\cos 3x}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{x^2+2x-4}{2x^2-3x+5}\right)^{\frac{2x+7}{4}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{x^2+2x-4}{x^2-3x+5}\right)^{\frac{2x+7}{4}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{3x^2+2x-4}{x^2-3x+5}\right)^{\frac{2x+7}{4}}$

Variant 11.

1. $\lim\limits_{x\to\infty}\dfrac{3x^4+5x+10}{2x^3+15x+21}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt{5x^3-4x+3}+\sqrt[5]{x^6+x-3}}{\sqrt[5]{x^4+3x^3-5}+\sqrt[4]{2x^6+x^5+7}}$ 3. $\lim\limits_{x\to3}\dfrac{6x^3-23x^2+15x}{x^3-6x^2+27}$.

4. $\lim\limits_{x\to-5}\dfrac{3-\sqrt[3]{x^2+2}}{\sqrt[3]{6+x}-1}$. 5. $\lim\limits_{x\to2}\dfrac{\sqrt{x^2+5}-3}{2-\sqrt{2x^2-4}}$; 6. $\lim\limits_{x\to0}\dfrac{\left(3^x-7^x\right)^2}{\sqrt[6]{1+3x^2}-1}$.

7. $\lim\limits_{x\to0}\dfrac{\log_2\cos 3x}{2\sin\frac{2x}{3}\tan\frac{12x}{5}}$; 8. $\lim\limits_{x\to3}\dfrac{\log_4(4-x)}{\tan\pi x}$. 9. $\lim\limits_{x\to-\frac{\pi}{6}}\dfrac{1+2\sin x}{2\sin(6x+\pi)}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{3x^3-3x+2}{x^3+2x-4}\right)^{\frac{x^2-1}{4x}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{3x^3-3x+2}{4x^3+2x-4}\right)^{\frac{x^2-1}{4x}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{3x^3-3x+2}{3x^3+2x-4}\right)^{\frac{x^2-1}{4x}}$

Variant 12.

1. $\lim\limits_{x\to\infty}\dfrac{2x^5-4x+7}{6x^7+2x-10}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt{5x^3-4x+3}-\sqrt[5]{x^6+x-3}}{\sqrt{2x^3+3x-1}-\sqrt[4]{3x^5+4x-2}}$ 3. $\lim\limits_{x\to2}\dfrac{-2x^3+9x^2-12x+4}{3x^3-8x^2-4x+16}$;

4. $\lim\limits_{x\to-2}\dfrac{\sqrt[3]{x^2-3}-1}{\sqrt[3]{3+x}-1}$. 5. $\lim\limits_{x\to1}\dfrac{5-\sqrt{3x^2+22}}{\sqrt{3+x}-\sqrt{5-x}}$; 6. $\lim\limits_{x\to0}\dfrac{1-\sqrt[8]{1+5x^3}}{\left(e^2-e^{3x+2}\right)\tan x^2}$.

7. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\ln\tan x}{4\cos 6x}$. 8. $\lim\limits_{x\to1}\dfrac{3\cos\frac{5\pi x}{2}}{\tan 5\pi x}$. 9. $\lim\limits_{x\to\pi}\dfrac{\arctan(1-\cos 2x)}{2^{\frac{\pi}{x}}-2}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-2x+7}{3x^2+7x-1}\right)^{\frac{x+2}{3}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-2x+7}{x^2+7x-1}\right)^{\frac{x+2}{3}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{3x^2-2x+7}{x^2+7x-1}\right)^{\frac{x+2}{3}}$

Variant 13.

1. $\lim\limits_{x\to\infty}\dfrac{10x^2-7x+8}{5x^3-x^2-10}$ 2. $\lim\limits_{x\to\infty}\left(\sqrt{x^2+3x-5}-\sqrt{x^2-x+10}\right)$ 3. $\lim\limits_{x\to-1}\dfrac{x^3-x^2-5x-3}{-3x^3-4x^2+x+2}$.

4. $\lim\limits_{x\to5}\dfrac{\sqrt[3]{x^2+2}-3}{2+\sqrt[3]{x-13}}$. 5. $\lim\limits_{x\to0}\dfrac{\sqrt{5-2x}-\sqrt{5+2x}}{\sin\left(\dfrac{\pi}{6}-3x\right)\sin4x}$; 6. $\lim\limits_{x\to0}\dfrac{e^x+e^{-x}-2}{\sin^2 3x}$.

7. $\lim\limits_{x\to\pi}\dfrac{2^{\cos^2\frac{x}{2}}-1}{\ln(2+\cos x)}$. 8. $\lim\limits_{x\to3}\dfrac{5\arcsin\dfrac{x-3}{4}}{3^{x^2-8}-3}$. 9. $\lim\limits_{x\to\frac{\pi}{2}}\dfrac{\cos3x-\cos x}{5(2x-\pi)^2}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-x+4}{2x^2+x+5}\right)^{\frac{x^3-5}{4x+3}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{2x^2-x+4}{x^2+x+5}\right)^{\frac{x^3-5}{4x+3}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-x+4}{x^2+x+5}\right)^{\frac{x^3-5}{4x+3}}$

Variant 14.

1. $\lim\limits_{x\to\infty}\dfrac{5x^3-2x^2+4x-3}{6x^3+5x+100}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[3]{6x^5+5x^4-3}+\sqrt[5]{x^6+5x+3}}{\sqrt[6]{4x^{10}-7x^5+10}+x+\sqrt{x-3}}$ 3. $\lim\limits_{x\to-2}\dfrac{x^3+5x^2+8x+4}{x^3+5x^2+5x-2}$.

4. $lim\limits_{x\to1}\dfrac{\sqrt[3]{x^2+3x+4}-2}{x^2-3x+2}$. 5. $\lim\limits_{x\to2}\dfrac{\sqrt{x^2+5}-3}{\sqrt{x+2}-2}$; 6. $lim\limits_{x\to0}\dfrac{\sqrt[3]{1+tg^2\dfrac{x}{2}}-1}{\left(e^{3x}-e^{2x}\right)^2}$.

7. $\lim\limits_{x\to0}\dfrac{3\sin x-\sin3x}{2x(1-\cos2x)}$; 8. $\lim\limits_{x\to4}\dfrac{1-2^{\sin\pi x}}{1-\cos\dfrac{\pi x}{2}}$. 9. $\lim\limits_{x\to-1}\dfrac{4\left(x^3+1\right)}{\sin(x+1)}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{-3x^2+x+5}{-x^2-x+7}\right)^{\frac{2x^3+5}{2-3x}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{-x^2+x+5}{-3x^2-x+7}\right)^{\frac{2x^3+5}{2-3x}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{-3x^2+x+5}{-3x^2-x+7}\right)^{\frac{2x^3+5}{2-3x}}$

Variant 15.

1. $\lim\limits_{x\to\infty}\dfrac{7x^4-3x^2+5}{6x^3+3x-4}$ 2. $\lim\limits_{x\to+\infty}\dfrac{\sqrt[5]{6x^7+2x^5-4}-\sqrt[3]{4x^2-3x}}{\sqrt[6]{7x^5-6x^4-3}+\sqrt[3]{x+5}}$ 3. $\lim\limits_{x\to-3}\dfrac{2x^3+15x^2+36x+27}{2x^3+7x^2+6x+9}$.

4. $\lim\limits_{x\to0}\dfrac{\sqrt[3]{2x^2+8}-2}{3+\sqrt[3]{5x^2-27}}$. 5. $\lim\limits_{x\to-1}\dfrac{4-\sqrt{-3x^3-5x+8}}{\sqrt{x^2+1}-\sqrt{2}}$; 6. $\lim\limits_{x\to0}\dfrac{e^2-e^{2-x^3}}{\left(x^2-3x\right)\cdot\sin\left(2x^2\right)}$;

7. $\lim\limits_{x\to0}\dfrac{\ln\left(1+\sin^2 2x\right)}{(\cos3x-1)\sin\left(3x+\dfrac{\pi}{6}\right)}$. 8. $\lim\limits_{x\to1}\dfrac{\sin\pi x}{\sin4\pi x}$. 9. $\lim\limits_{x\to\pi}\left(\sin\dfrac{\pi-x}{2}\cdot\tan\dfrac{\pi^2}{2x}\right)$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{2x^3+4}{5+x^2+x^3}\right)^{\frac{\left(x^2+4\right)x}{7x+2}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{x^3+4}{5+x^2+x^3}\right)^{\frac{\left(x^2+4\right)x}{7x+2}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{x^3+4}{5+x^2+2x^3}\right)^{\frac{\left(x^2+4\right)x}{7x+2}}$

Variant 16.

1. $\lim\limits_{x\to\infty}\dfrac{8x^4+17x^2+9}{5x^4+6x-3}$ 2. $\lim\limits_{x\to\infty}\left(\sqrt{x^4+2x^2+8}-\sqrt{x^4+x+3}\right)$ 3. $\lim\limits_{x\to-2}\dfrac{3x^3+17x^2+32x+20}{-5x^3-18x^2-12x+8}$;

4. $\lim\limits_{x\to-2}\dfrac{x^2+2x}{\sqrt[3]{5x+2}+2}$. 5. $\lim\limits_{x\to1}\dfrac{\sqrt{2x^2+3x+4}-3}{2-\sqrt{3x^2+1}}$; 6. $\lim\limits_{x\to0}\dfrac{\arctan(1-\cos x)}{\left(2^{x^2}-3^{x^2}\right)(4x+1)}$;

7. $\lim\limits_{x\to 0}\dfrac{\sin\left(x^3+4x\right)\cdot\tan 3x}{\log_2\left(1+2x^2\right)}$.

8. $\lim\limits_{x\to -1}\dfrac{\cos\dfrac{\pi x}{2}}{\cos\dfrac{3\pi x}{2}}$.

9. $\lim\limits_{x\to\frac{\pi}{2}}\left(\pi^2-4x^2\right)\cdot\tan 3x$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-3x+2}{3x^2+x-2}\right)^{\frac{4-x^2}{4-3x}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{3x^2-3x+2}{3x^2+x-2}\right)^{\frac{4-x^2}{4-3x}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{3x^2-3x+2}{x^2+x-2}\right)^{\frac{4-x^2}{4-3x}}$

Variant 17.

1. $\lim\limits_{x\to\infty}\dfrac{11x^5+x^4-19}{12x^3+10x+2}$

2. $\lim\limits_{x\to\infty}\dfrac{\sqrt{4x^4+8x^3-5}+\sqrt[6]{x^5+4x+5}}{(x^2+5)\sqrt[3]{x^6+3x+2}}$

3. $\lim\limits_{x\to 4}\dfrac{x^3-6x^2+7x+4}{x^3-2x^2-4x-16}$.

4. $\lim\limits_{x\to -3}\dfrac{\sqrt[3]{2x-2}+\sqrt[3]{x^2-1}}{3+\sqrt[3]{5x-12}}$.

5. $\lim\limits_{x\to 2}\dfrac{\sqrt{2x^3-15}-1}{\sqrt{7-x^2}-\sqrt{x^2-1}}$;

6. $\lim\limits_{x\to 0}\dfrac{\log_4(1+\tan 2x)}{4\sin\left(\dfrac{\pi}{3}+2x\right)\arcsin 3x}$.

7. $\lim\limits_{x\to 0}\dfrac{4^{x+1}-4^{1-x}}{\cos\dfrac{3x}{2}\sin\left(5x^2+x\right)}$;

8. $\lim\limits_{x\to\pi}\dfrac{e^{2\sin x}-e^{\sin 2x}}{4\left(\pi^2-x^2\right)}$.

9. $\lim\limits_{x\to\frac{\pi}{2}}\dfrac{\sqrt[5]{1+\tan 2x}-1}{3\cos 3x(1+\sin 3x)}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{5x-x^2+x^3}{7-2x+3x^3}\right)^{\frac{2+3x^4}{x^3+2}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{5x-x^2+x^3}{7-2x+x^3}\right)^{\frac{2+3x^4}{x^3+2}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{5x-x^2+3x^3}{7-2x+x^3}\right)^{\frac{2+3x^4}{x^3+2}}$

Variant 18.

1. $\lim\limits_{x\to\infty}\dfrac{15x^3+7x^2+5}{23x^4-17x+8}$

2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[10]{x^{11}+8x^{10}+5}+\sqrt[7]{x^{12}+7x^2+5}}{\sqrt[8]{x^9+x^5+1}+\sqrt{x+8}}$

3. $\lim\limits_{x\to 3}\dfrac{-x^3+8x^2-21x-18}{x^3-3x^2-9x+27}$;

4. $\lim\limits_{x\to -1}\dfrac{\sqrt[3]{5x^2+3}+\sqrt[3]{x^3-7}}{1-\sqrt[3]{3x^2-2}}$.

5. $\lim\limits_{x\to 4}\dfrac{\sqrt{3x-8}-\sqrt{x}}{\sqrt{2x-4}-\sqrt{8-x}}$;

6. $\lim\limits_{x\to 0}\dfrac{4\cos 5x(1-\cos 3x)}{7^x+7^{-x}-2}$;

7. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\sqrt{2}\sin^3 x-\sin\dfrac{\pi}{6}}{\tan x-\cot x}$.

8. $\lim\limits_{x\to 3}\dfrac{\tan\dfrac{\pi}{2x}\cdot\cot\dfrac{3\pi}{2x}}{2\arcsin\left(\dfrac{x}{3}-1\right)}$.

9. $\lim\limits_{x\to\pi}\dfrac{\ln\left(1+2\sin^2 x\right)}{3(\cos 2x-1)}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{3+2x-x^2}{4-x-x^2}\right)^{\frac{3x^4+1}{x+2}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{3+2x-2x^2}{4-x-x^2}\right)^{\frac{3x^4+1}{x+2}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{3+2x-x^2}{4-x-2x^2}\right)^{\frac{3x^4+1}{x+2}}$

Variant 19.

1. $\lim\limits_{x\to\infty}\dfrac{11x^5+7x^4-12}{3x^5+6x^3-13x}$

2. $\lim\limits_{x\to\infty}\left(\sqrt{x^3+4x+5}-\sqrt{x^3-1}\right)$

3. $\lim\limits_{x\to -3}\dfrac{x^3-4x+15}{x^3+5x^2+3x-9}$.

4. $\lim\limits_{x\to -2}\dfrac{\sqrt[3]{x^2+4}-\sqrt[3]{3x^2-4}}{\sqrt[3]{6-x}-2}$.

5. $\lim\limits_{x\to 2}\dfrac{\sqrt{6x-3}-\sqrt{4x+1}}{\sqrt{1+x^3}-3}$;

6. $\lim\limits_{x\to 0}\dfrac{2\left(e^{x+1}-e^{1-x}\right)\cdot\cos\dfrac{3x}{2}}{\ln(1-\tan 2x)}$.

7. $\lim\limits_{x\to -\frac{\pi}{4}}\dfrac{\cos^3 x+\sin^3 x}{3\sin 4x}$.

8. $\lim\limits_{x\to\frac{\pi}{6}}\dfrac{\left(2\cos x-\sqrt{3}\right)\sin 3x}{(2\cos 2x-1)\cos 2x}$.

9. $\lim\limits_{x\to 1}\left(\sin\dfrac{1-x}{2}\cdot\tan\dfrac{\pi x}{2}\right)^2$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{2x^4-3}{x^4+2x-1}\right)^{\frac{3x^2-1}{5}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{x^4-3}{2x^4+2x-1}\right)^{\frac{3x^2-1}{5}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{x^4-3}{x^4+2x-1}\right)^{\frac{3x^2-1}{5}}$.

Variant 20.

1. $\lim\limits_{x\to\infty}\dfrac{8x^3+5x^2-4}{3x^4+6x+11}$

2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[3]{6x^2+3}-\sqrt[5]{x^3-4x+5}}{\sqrt[4]{3x^2+5x-4}-\sqrt[4]{3x^2-x-1}}$

3. $\lim\limits_{x\to-1}\dfrac{-x^3-3x^2+x+3}{3x^3+5x^2+x-1}$.

4. $\lim\limits_{x\to1}\dfrac{\sqrt[3]{5+3x}+\sqrt[3]{4x-12}}{\sqrt[3]{x^3+7}-2}$.

5. $\lim\limits_{x\to-3}\dfrac{\sqrt{3x^2-2}-\sqrt{2x^2+7}}{\sqrt{4+x}-1}$;

6. $\lim\limits_{x\to0}\dfrac{\log_5(2\cos x-1)}{\tan\left(\dfrac{\pi}{4}-2x\right)\left(2^{x^2}-3^{x^2}\right)}$.

7. $\lim\limits_{x\to\pi}\dfrac{3\sin^2 x}{1+\cos^3 x}$.

8. $\lim\limits_{x\to-\frac{\pi}{6}}\dfrac{2(1+\sin 3x)\cos x}{\cot 3x}$.

9. $\lim\limits_{x\to-2}\dfrac{\cos\dfrac{\pi}{2x}+\sin\dfrac{\pi}{2x}}{\sqrt[5]{1+\tan\pi x}-1}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{2+3x-x^3}{1-x-2x^3}\right)^{\frac{x^2+5}{3}}$;

11. $\lim\limits_{x\to\infty}\left(\dfrac{2+3x-x^3}{1-x-x^3}\right)^{\frac{x^2+5}{3}}$;

12. $\lim\limits_{x\to\infty}\left(\dfrac{2+3x-3x^3}{1-x-x^3}\right)^{\frac{x^2+5}{3}}$.

Variant 21.

1. $\lim\limits_{x\to\infty}\dfrac{4x^3+5x^2+11}{13x^2-5x-7}$

2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[4]{3x^5+8x^2-5}+\sqrt[3]{2x^2-x}}{\sqrt[8]{x^9+10x-1}-\sqrt{x+5}}$

3. $\lim\limits_{x\to3}\dfrac{x^3+5x^2-8x-48}{x^3-5x^2+5x+3}$;

4. $\lim\limits_{x\to2}\dfrac{\sqrt[3]{4+2x}-\sqrt[3]{5x-2}}{5-\sqrt{3x^3+1}}$.

5. $\lim\limits_{x\to-1}\dfrac{\sqrt{x^2+3}-\sqrt{5+x}}{4-\sqrt{3x^2-7x+6}}$;

6. $\lim\limits_{x\to0}\dfrac{(3x-5)(\cos3x-\cos5x)}{(3x+5)(\sin3x-\sin5x)\tan2x}$;

7. $\lim\limits_{x\to\frac{\pi}{6}}\dfrac{3\sin x\cdot\lg(\sin3x)}{2\tan\left(2x+\dfrac{2\pi}{3}\right)\tan\left(x-\dfrac{\pi}{3}\right)}$.

8. $\lim\limits_{x\to\frac{\pi}{6}}\dfrac{1-\sqrt[3]{\sin3x}}{\sqrt{\tan\dfrac{3x}{2}-1}}$.

9. $\lim\limits_{x\to-1}\dfrac{2\tan\left(x^2-1\right)}{e^{x^2+3x+2}-1}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+3x^2}{1+x+x^2}\right)^{\frac{2x^2+5}{4-x}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+x^2}{1+x+3x^2}\right)^{\frac{2x^2+5}{4-x}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+x^2}{1+x+x^2}\right)^{\frac{2x^2+5}{4-x}}$

Variant 22.

1. $\lim\limits_{x\to\infty}\dfrac{25x^4+7x^3-3}{8x^6+5x+4}$

2. $\lim\limits_{x\to+\infty}\left(\sqrt{x^2+4x+5}-\sqrt{x^2-2x-1}\right)$

3. $\lim\limits_{x\to1}\dfrac{x^3+3x^2-4}{3x^3-10x^2+11x-4}$;

4. $\lim\limits_{x\to-1}\dfrac{\sqrt[3]{2x+10}-\sqrt[3]{x^2+7}}{\sqrt[3]{2+x}-1}$.

5. $\lim\limits_{x\to2}\dfrac{\sqrt{3x^2-4}-2\sqrt{6-x^2}}{3-\sqrt{x^2+5}}$;

6. $\lim\limits_{x\to0}\dfrac{2\left(e^{5x}-e^{7x}\right)}{\cos4x(\sin5x-\sin7x)}$;

7. $\lim\limits_{x\to\frac{\pi}{3}}\dfrac{1-4\cos^2 x}{\sin(3x-\pi)}$.

8. $\lim\limits_{x\to b}\dfrac{1-3^{b^2-x^2}}{\tan\left(\ln\dfrac{x}{b}\right)\sin(x+b)}$.

9. $\lim\limits_{x\to\frac{1}{2}}\dfrac{3\sin\pi x\cos3\pi x}{\log_3(4x-1)}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{x^3+2x-1}{4x^3-x^2+5}\right)^{\frac{3-x^4}{x^3+1}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{x^3+2x-1}{x^3-x^2+5}\right)^{\frac{3-x^4}{x^3+1}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{4x^3+2x-1}{x^3-x^2+5}\right)^{\frac{3-x^4}{x^3+1}}$.

Variant 23.

1. $\lim\limits_{x\to\infty}\dfrac{7x^3+8x^2+1}{12x^3-9x+5}$

2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[4]{3x^2+2x-1}+\sqrt[5]{x^2+4x-3}}{\sqrt[6]{5x^7+4x+5}+\sqrt{x+3}}$

3. $\lim\limits_{x\to1}\dfrac{x^3-5x^2+7x-3}{-2x^3+5x^2-4x+1}$.

4. $\lim\limits_{x\to2}\dfrac{\sqrt{3x^2-8}-\sqrt{12-2x^2}}{1-\sqrt{3-x}}$.

5. $\lim\limits_{x\to3}\dfrac{\sqrt[3]{x+5}-\sqrt[3]{2x^2-10}}{\sqrt[3]{x^2-1}-2}$;

6. $\lim\limits_{x\to0}\dfrac{\left(7^x-9^x\right)3^{x+1}}{4\cos^2\dfrac{x}{2}\left(1-\cos5\sqrt{x}\right)}$;

7. $\lim\limits_{x\to\frac{1}{4}}\dfrac{\cos\pi x-\sin\pi x}{\tan4\pi x\cdot\cot\pi x}$.

8. $\lim\limits_{x\to\frac{\pi}{6}}\dfrac{2^{\cos^2 3x}-1}{1-\sqrt[3]{\sin3x}}$.

9. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\cot^3 x-1}{2-\cot x-\cot^3 x}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{-x^2+5x+4}{4-2x-3x^2}\right)^{\frac{5x^3}{4-x^2}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{-3x^2+5x+4}{4-2x-3x^2}\right)^{\frac{5x^3}{4-x^2}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{-3x^2+5x+4}{4-2x-x^2}\right)^{\frac{5x^3}{4-x^2}}$

Variant 24.

1. $\lim\limits_{x\to\infty}\dfrac{12x^5+6x-1}{5x^4-4x^3+3}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[3]{8x^3+4x-5}+\sqrt{x-3}}{\sqrt{x^2-2x-15}-\sqrt[4]{x+5}}$ 3. $\lim\limits_{x\to-4}\dfrac{x^3+8x^2+16x}{x^3+x^2-11x+4}$;

4. $\lim\limits_{x\to-2}\dfrac{\sqrt[3]{3x-2}-\sqrt[3]{x+10}}{\sqrt[3]{x^2-3}-1}$. 5. $\lim\limits_{x\to1}\dfrac{\sqrt{5x^2-4}-\sqrt{3-2x^2}}{\sqrt{1+3x}-2}$; 6. $\lim\limits_{x\to0}\dfrac{\ln\cos2x}{\log_2\cos3x}$;

7. $\lim\limits_{x\to\frac{\pi}{3}}\dfrac{(1+\cos3x)(1-\sin3x)}{\tan^2 6x}$. 8. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{2-3^{\cos2x}-3^{\sin4x}}{5\sin4x\cos3x}$. 9. $\lim\limits_{x\to\frac{\pi}{6}}\dfrac{(2\sin x-1)\sin3x}{2\cos x-\sqrt{3}}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{4-x+x^3}{7+3x+x^3}\right)^{\frac{3x^4-1}{4+x^3}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{4-x+2x^3}{7+3x+x^3}\right)^{\frac{3x^4-1}{4+x^3}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{4-x+x^3}{7+3x+2x^3}\right)^{\frac{3x^4-1}{4+x^3}}$

Variant 25.

1. $\lim\limits_{x\to\infty}\dfrac{6x^5+4x+3}{10x^3+5x^2-1}$ 2. $\lim\limits_{x\to+\infty}\left(\sqrt{x^2+7x-4}-\sqrt{x^2+3}\right)$ 3. $\lim\limits_{x\to1}\dfrac{x^3-3x+2}{3x^3-10x^2+11x-4}$

4. $\lim\limits_{x\to-1}\dfrac{\sqrt[3]{3x^3+11}-\sqrt[3]{5x^2+3}}{\sqrt[3]{2+x}-1}$ 5. $\lim\limits_{x\to2}\dfrac{\sqrt{3x^2+4}-2\sqrt{8x-3x^2}}{x^2-2x}$ 6. $\lim\limits_{x\to0}\dfrac{e^{2+x^2}-e^{2-x^2}}{\arcsin\dfrac{3x}{2}\tan\left(5x^2-x\right)}$

7. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\cos\left(3x-\dfrac{\pi}{4}\right)\sin2x}{2(\cos x-\sin x)}$ 8. $\lim\limits_{x\to\pi}\dfrac{\sin3x}{\pi^2-x^2}$ 9. $\lim\limits_{x\to e}\dfrac{(\ln x)^2-1}{x-e}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{2x^2-4x+1}{x^2+2x-3}\right)^{\frac{5-2x^4}{x^3+1}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-4x+1}{2x^2+2x-3}\right)^{\frac{5-2x^4}{x^3+1}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-4x+1}{x^2+2x-3}\right)^{\frac{5-2x^4}{x^3+1}}$

Variant 26.

1. $\lim\limits_{x\to\infty}\dfrac{4x^3+18x-3}{3x^3+5x+10}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[4]{12x^5+5x-3}+\sqrt[3]{x^2-3x+2}}{\sqrt[5]{5x^3-4x+3}+\sqrt[5]{x^6+5x-3}}$ 3. $\lim\limits_{x\to1}\dfrac{3x^3-10x^2+11x-4}{x^3+3x^2-4}$

4. $\lim\limits_{x\to-2}\dfrac{\sqrt[3]{9+x^3}-\sqrt[3]{10x^2-39}}{\sqrt[3]{3+x}-1}$ 5. $\lim\limits_{x\to3}\dfrac{\sqrt{3x^2-2}-\sqrt{2x^2+7}}{4\left(x^2-3x\right)}$ 6. $\lim\limits_{x\to0}\dfrac{\cos3x^2\arctan\dfrac{2x}{3}}{4\sin\left(3x-x^2\right)}$

7. $\lim\limits_{x\to\frac{\pi}{4}}\dfrac{\sqrt{\cos2x}}{\tan^2 x-1}$ 8. $\lim\limits_{x\to5}\dfrac{\log_5 x-1}{2\sin(5-x)}$ 9. $\lim\limits_{x\to1}\dfrac{\sin2x-\sin2}{6x-6x^2}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{4-2x^2+x^3}{8+x+2x^3}\right)^{\frac{4x^3}{2x^2-3}}$ 11. $\lim\limits_{x\to\infty}\left(\dfrac{4-2x^2+2x^3}{8+x+2x^3}\right)^{\frac{4x^3}{2x^2-3}}$ 12. $\lim\limits_{x\to\infty}\left(\dfrac{4-2x^2+x^3}{8+x+x^3}\right)^{\frac{4x^3}{2x^2-3}}$

Variant 27.

1. $\lim\limits_{x\to\infty}\dfrac{3x^2-5x+14}{7x^3+2x^2-3}$ 2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[5]{6x^3+5x+3}+\sqrt[3]{x^4+6x^2-3}}{\sqrt{x^3-5x+3}+\sqrt[6]{x^2-4x+5}}$ 3. $\lim\limits_{x\to-1}\dfrac{3x^3+5x^2+x-1}{3x^3+3x^2+4x+4}$

4. $\lim\limits_{x\to 1}\dfrac{\sqrt[3]{5x^2-4}+\sqrt[3]{3-4x^2}}{\sqrt[3]{x+7}-2}$

5. $\lim\limits_{x\to -2}\dfrac{\sqrt{x^2+5}-\sqrt{2x+13}}{2x^2+3x-2}$

6. $\lim\limits_{x\to 0}\dfrac{3tg\left(\dfrac{\pi}{4}-3x\right)\left(1-\cos 2\sqrt{x}\right)}{\left(5^x+3^x-2\right)\cos\left(2x+\dfrac{\pi}{3}\right)}$

7. $\lim\limits_{x\to\sqrt{3}}\dfrac{3\arctan x-\pi}{\left(3-x^2\right)\arcsin\dfrac{x}{2}}$

8. $\lim\limits_{x\to 3}\dfrac{\left(8-2^x\right)\left(3+2^x\right)}{\sin\pi x}$

9. $\lim\limits_{x\to 1}\dfrac{2^{\sin\pi x}-1}{\tan\left(\ln\left(3x-2\right)\right)}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{3x^2-2x+5}{x^2+3x+1}\right)^{\frac{5x^4+3}{4-x^3}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-2x+5}{x^2+3x+1}\right)^{\frac{5x^4+3}{4-x^3}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-2x+5}{3x^2+3x+1}\right)^{\frac{5x^4+3}{4-x^3}}$

Variant 28.

1. $\lim\limits_{x\to\infty}\dfrac{7x^3+5x-3}{2x^3+4x^2+5}$

2. $\lim\limits_{x\to+\infty}\left(\sqrt{x^6+4x^3-3}-\sqrt{x^6-x+4}\right)$

3. $\lim\limits_{x\to 3}\dfrac{x^3-4x^2-3x+18}{x^3-3x^2-4x+12}$

4. $\lim\limits_{x\to 2}\dfrac{\sqrt[3]{9-2x^2}-\sqrt[3]{3x^2-11}}{\sqrt[3]{1-x}+1}$

5. $\lim\limits_{x\to 1}\dfrac{\sqrt{3x+6}-\sqrt{4x^2+5}}{2x-2x^2}$

6. $\lim\limits_{x\to 0}\dfrac{e^{\sin 3x}-e^{\sin x}}{2\cos 5x\cdot\arctan 4x}$

7. $\lim\limits_{x\to\sqrt{2}}\dfrac{\arccos\dfrac{x}{2}-\arcsin\dfrac{x}{2}}{4\arctan\dfrac{x}{\sqrt{2}}\left(x^2-2\right)}$

8. $\lim\limits_{x\to 1}\dfrac{2\sin\left(x^2-x\right)\cos\left(3x^2+x-4\right)}{\ln\left(4x^2+2x-5\right)}$

9. $\lim\limits_{x\to\pi}\dfrac{1-3^{\sin 2x}}{\arcsin\left(\tan 2x\right)}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{3-4x^2+x^3}{2+2x+4x^3}\right)^{\frac{5-2x^4}{4+x^2}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{3-4x^2+4x^3}{2+2x+x^3}\right)^{\frac{5-2x^4}{4+x^2}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{3-4x^2+x^3}{2+2x+x^3}\right)^{\frac{5-2x^4}{4+x^2}}$

Variant 29.

1. $\lim\limits_{x\to\infty}\dfrac{4x^2+3x-2}{5x^2+3x-1}$

2. $\lim\limits_{x\to+\infty}\left(\sqrt{x^3+2x+5}-\sqrt{x^3-x+4}\right)\sqrt{x}$

3. $\lim\limits_{x\to 1}\dfrac{x^3-3x+2}{x^3+5x^2+3x-9}$

4. $\lim\limits_{x\to 1}\dfrac{\sqrt{3x+1}-\sqrt{x^2+3}}{x^2-x}$

5. $\lim\limits_{x\to 2}\dfrac{\sqrt[3]{3x^2-4}-2}{\sqrt[3]{x+6}+\sqrt[3]{4-3x^2}}$

6. $\lim\limits_{x\to 0}\dfrac{\log_2\left(1+2x^2\right)}{3^{x^2+1}-3}$

7. $\lim\limits_{x\to 1}\dfrac{e^x-e}{\sin 2\left(x^2-1\right)}$

8. $\lim\limits_{x\to\frac{\pi}{3}}\dfrac{\ln\cos 6x}{\arcsin\left(3x-\pi\right)^2}$

9. $\lim\limits_{x\to\frac{\pi}{6}}\dfrac{1-\sqrt{\sin 3x}}{\sqrt{\tan\dfrac{3x}{2}}-1}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+x^3}{3+2x+5x^3}\right)^{\frac{4x^4+3}{x^3-4}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+5x^3}{3+2x+x^3}\right)^{\frac{4x^4+3}{x^3-4}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{2-3x+x^3}{3+2x+x^3}\right)^{\frac{4x^4+3}{x^3-4}}$

Variant 30.

1. $\lim\limits_{x\to\infty}\dfrac{3x^3-2x+5}{2x^2+4x-3}$

2. $\lim\limits_{x\to\infty}\dfrac{\sqrt[3]{5x^2-4x+3}+\sqrt[3]{x^3-4x^2+5}}{x^2+\sqrt{3x^2+5x-3}+\sqrt[4]{x-3}}$

3. $\lim\limits_{x\to -2}\dfrac{\sqrt{x+6}-\sqrt{2x^2-4}}{x^2+5x+6}$

4. $\lim\limits_{x\to 3}\dfrac{3-\sqrt[3]{4x^2-9}}{1+\sqrt[3]{x-4}}$

5. $\lim\limits_{x\to 0}\dfrac{\cos 2x-\cos 4x}{x\cdot\sin 3x}$

6. $\lim\limits_{x\to 0}\dfrac{2^x-5^x}{\ln\left(1+\tan 2x\right)}$

7. $\lim\limits_{x\to\frac{\pi}{4}} \dfrac{\cot x-1}{\sqrt[3]{\cos 2x}}$

8. $\lim\limits_{x\to\frac{\pi}{3}} \dfrac{8\sin^3\frac{x}{2}-1}{\sin(\pi-3x)}$

9. $\lim\limits_{x\to 10} \dfrac{\log_{10} x-1}{x^2-11x+10}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{3+2x^2-3x^3}{5-x^2-x^3}\right)^{\frac{5-x^4}{4-x^3}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{3+2x^2-3x^3}{5-x^2-3x^3}\right)^{\frac{5-x^4}{4-x^3}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{3+2x^2-x^3}{5-x^2-3x^3}\right)^{\frac{5-x^4}{4-x^3}}$

Variant 31.

1. $\lim\limits_{x\to\infty} \dfrac{3x^2-x+4}{2x^3-4x^2+3}$

2. $\lim\limits_{x\to\infty} \dfrac{\sqrt{3x^4+5x-3}+\sqrt[3]{2x^3+5x^2+4}}{\sqrt[4]{7x^3+4x^2+3}-\sqrt{2x^5+7x^4-5}}$

3. $\lim\limits_{x\to 3} \dfrac{3x^2-7x-6}{2x^2+x-21}$

4. $\lim\limits_{x\to 2} \dfrac{3x^3-7x^2-8x+20}{-5x^3+22x^2-28x+8}$;

5. $\lim\limits_{x\to 1} \dfrac{\sqrt{3x+1}-\sqrt{2x+2}}{\sqrt{8x+1}-3}$

6. $\lim\limits_{x\to 0} \dfrac{\sin 3x}{\tan 2x}$

7. $\lim\limits_{x\to\pi} \dfrac{\tan^2 5x}{\left(e^{\pi}-e^{x}\right)^2}$

8. $\lim\limits_{x\to\frac{\pi}{2}} \dfrac{\cos 5x-\cos 3x}{1-\cos 4x}$

9. $\lim\limits_{x\to\frac{1}{3}} \dfrac{(1-3x)^2}{\sin 3\pi x\tan 6\pi x}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{1-x}{10-2x}\right)^{\frac{1+3x^2}{x}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{3-2x}{7-2x}\right)^{\frac{1+3x^2}{x}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{5-2x}{11-x}\right)^{\frac{1+3x^2}{x}}$

Variant 32.

1. $\lim\limits_{x\to\infty} \dfrac{3x^5+4x^4-3x-2}{7x^3-2x+5}$

2. $\lim\limits_{x\to+\infty} \dfrac{\sqrt[3]{5x^4-3x^3+7+x}+\sqrt[3]{x^2-4x+3}}{\sqrt[5]{x^2+3x-2}+\sqrt[6]{x+5}}$

3. $\lim\limits_{x\to 3}\left(\dfrac{x+2}{x-3}-\dfrac{x^2-7x}{x^2-2x-3}\right)$

4. $\lim\limits_{x\to 3} \dfrac{x^3-3x^2-9x+27}{-x^3+11x^2-39x+45}$

5. $\lim\limits_{x\to 2} \dfrac{\sqrt{4}-\sqrt[3]{x+6}}{\sqrt{x+2}-2}$

6. $\lim\limits_{x\to 0} \dfrac{\arcsin^2 x}{x\sin x}$

7. $\lim\limits_{x\to 3} \dfrac{\ln(2x-5)}{\tan 3-\tan x}$

8. $\lim\limits_{x\to 1} \dfrac{1+\cos 3\pi x}{\tan^2 \pi x}$

9. $\lim\limits_{x\to 1} \dfrac{\sin\pi(x+1)}{2-2^{4x-3}}$

10. $\lim\limits_{x\to\infty}\left(\dfrac{3x-7}{3x+1}\right)^{\frac{x+1}{4}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{x-7}{3x+1}\right)^{\frac{x+1}{4}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{3x-7}{x+1}\right)^{\frac{x+1}{4}}$

Variant 33.

1. $\lim\limits_{x\to\infty} \dfrac{2x^3-4x^2+3}{4x^2+7x-5}$

2. $\lim\limits_{x\to\infty}\left(\sqrt{3x^2+4x-3}-\sqrt{3x^2-2x+7}\right)$

3. $\lim\limits_{x\to -1} \dfrac{x^3-x^2-5x-3}{-3x^3-4x^2+x+2}$.

4. $\lim\limits_{x\to 5} \dfrac{\sqrt[3]{x^2+2}-3}{2+\sqrt[3]{x-13}}$.

5. $\lim\limits_{x\to 0} \dfrac{\sqrt{5-2x}-\sqrt{5+2x}}{\sin\left(\dfrac{\pi}{6}-3x\right)\sin 4x}$;

6. $\lim\limits_{x\to 0} \dfrac{e^{x}+e^{-x}-2}{\sin^2 3x}$.

7. $\lim\limits_{x\to\pi} \dfrac{2^{\cos^2\frac{x}{2}}-1}{\ln(2+\cos x)}$.

8. $\lim\limits_{x\to 3} \dfrac{5\arcsin\dfrac{x-3}{4}}{3^{x^2-8}-3}$.

9. $\lim\limits_{x\to\frac{\pi}{2}} \dfrac{\cos 3x-\cos x}{5(2x-\pi)^2}$.

10. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-x+4}{2x^2+x+5}\right)^{\frac{x^3-5}{4x+3}}$

11. $\lim\limits_{x\to\infty}\left(\dfrac{2x^2-x+4}{x^2+x+5}\right)^{\frac{x^3-5}{4x+3}}$

12. $\lim\limits_{x\to\infty}\left(\dfrac{x^2-x+4}{x^2+x+5}\right)^{\frac{x^3-5}{4x+3}}$

Problem 2. a) Find points of discontinuity, determine their type and draw a sketch of the function behavior near the discontinuity points; b) Find the parameter at which a give function to be continuous (if it is possible).

Variant 1. a) $f(x)=\dfrac{\operatorname{arc\,tan}\dfrac{1}{x-2}}{x+1}$, b) $f(x)=\begin{cases}x^2,-\infty<x<1,\\ Ax-1,1\le x<\infty.\end{cases}$

Variant 2 a) $f(x)=\dfrac{\sin(x-3)}{x^2-9}$, b) $f(x)=\begin{cases}\dfrac{1}{x^2+1},-\infty<x<2,\\ -\dfrac{A}{10}x,2\le x<\infty.\end{cases}$

Variant 3. a) $f(x)=2^{\frac{x-1}{x^2-1}}$, b) $f(x)=\begin{cases}x^2+3,-4<x\le 3,\\ \dfrac{A}{x-3},3<x<\infty.\end{cases}$

Variant 4. a) $f(x)=\dfrac{x^2-16}{x-4}e^{\frac{1}{x}}$, b) $f(x)=\begin{cases}\sin x,x\le 0,\\ Ax+2,x>0.\end{cases}$

Variant 5. a) $f(x)=\dfrac{x^2-1}{\sqrt{x}-1}3^{\frac{1}{x-2}}$, b) $f(x)=\begin{cases}\cos\dfrac{\pi}{2}x,-\infty<x<1,\\ Ax-1,1\le x<\infty.\end{cases}$

Variant 6. a) $f(x)=\dfrac{1}{\ln(x-3)}$, b) $f(x)=\begin{cases}x+1,-\infty<x\le -1,\\ \dfrac{x^2-1}{x+1},-1<x<\infty.\end{cases}$

Variant 7. a) $f(x)=(1+x)\operatorname{arc\,tan}\dfrac{1}{1-x^2}$, b) $f(x)=\begin{cases}-2\cos x,x\le\pi,\\ \sin x+A,\pi<x<2\pi.\end{cases}$

Variant 8. a) $f(x)=\dfrac{x-4}{\sqrt{x}-2}2^{\frac{1}{x-5}}$, b) $f(x)=\begin{cases}\ln x,1<x\le e,\\ Ax-e,x>e.\end{cases}$

Variant 9. a) $f(x)=\dfrac{x^2-4}{x+2}3^{\frac{1}{x}}$, b) $f(x)=\begin{cases}x,0<x\le 1,\\ -x^2+4x-A,1<x<5x.\end{cases}$

Variant 10. a) $f(x)=\dfrac{\sin x}{x(x+2)}$, b) $f(x)=\begin{cases}x+2,x\le 1,\\ -Ax^2,-1<x<4.\end{cases}$

Variant 11. a) $f(x)=\dfrac{x}{\ln(1+x)}$, b) $f(x)=\begin{cases}2^x,-\infty<x<0,\\ A-x,0\le x<\infty.\end{cases}$

Variant 12. a) $f(x)=2^{\frac{1}{x-1}}\dfrac{\sin(x-4)}{x-4}$, b) $f(x)=\begin{cases}x+2,-\infty<x\le 0,\\ Ae^{\frac{x}{x+1}},0<x<\infty.\end{cases}$

Variant 13. a) $f(x)=\dfrac{\operatorname{arc\,tan}\dfrac{1}{1-x}}{x+2}$, b) $f(x)=\begin{cases}x^3,-\infty\le x\le 1,\\ Ax+1,1<x<\infty.\end{cases}$

Variant 14. a) $f(x)=\dfrac{\sin(x-1)}{x^2-1}$, b) $f(x)=\begin{cases}\dfrac{1}{x^2+1},-\infty<x<2,\\ -\dfrac{A}{4}x,2\le x<\infty.\end{cases}$

Variant 15. a) $f(x)=2^{\frac{x-4}{x^2-16}}$, b) $f(x)=\begin{cases}x^2-1,-4<x\le 1,\\ \dfrac{A}{x+2},1<x<\infty.\end{cases}$

Variant 16. a) $f(x)=\dfrac{x^2-9}{x-3}e^{\frac{1}{x}}$, b) $f(x)=\begin{cases}\sin x, x\le -\dfrac{\pi}{2},\\ Ax+1, -\dfrac{\pi}{2}<x<\infty.\end{cases}$

Variant 17. a) $f(x)=\dfrac{x^2-4}{x-2}3^{\frac{1}{x-1}}$, b) $f(x)=\begin{cases}\cos\dfrac{\pi}{2}x, -\infty<x\le 2,\\ Ax+2, 2<x<\infty.\end{cases}$

Variant 18. a) $f(x)=\dfrac{x-9}{\sqrt{x}-3}2^{\frac{1}{x}}$, b) $f(x)=\begin{cases}2x, 0<x\le 1,\\ -x^2+Ax, 1<x<\infty.\end{cases}$

Variant 19. a) $f(x)=\dfrac{\sin 2x}{x(x+2)}$, b) $f(x)=\begin{cases}x+3, x\le 1,\\ -Ax^3, 1<x<4.\end{cases}$

Variant 20. a) $f(x)=\dfrac{x}{\ln(1+4x)}$, b) $f(x)=\begin{cases}3^x, -\infty<x<0,\\ A+x, 0\le x<\infty.\end{cases}$

Variant 21. a) $f(x)=2^{\frac{1}{x}}\dfrac{\sin(x+1)}{x+1}$, b) $f(x)=\begin{cases}x-2, -\infty<x\le 0,\\ Ae^{\frac{x}{x+2}}, 0<x<\infty.\end{cases}$

Variant 22 a) $f(x)=\dfrac{\operatorname{arc\,tan}\dfrac{1}{x-1}}{x}$, b) $f(x)=\begin{cases}x^2+4, -\infty<x\le 1,\\ Ax, 1<x<\infty.\end{cases}$

Variant 23. a) $f(x)=\dfrac{x^2-4}{x-2}e^{\frac{1}{x}}$, b) $f(x)=\begin{cases}\dfrac{1}{x^2}, -\infty<x\le -3,\\ \dfrac{A}{5}x, -3<x.\end{cases}$

Variant 24. a) $f(x)=\dfrac{\sin(x-2)}{x^2-4}$, b) $f(x)=\begin{cases}\ln x, 1<x\le e,\\ Ax^2-5, e<x<\infty.\end{cases}$

Variant 25. a) $f(x)=2^{\frac{x+1}{x^2-1}}$, b) $f(x)=\begin{cases}\operatorname{arc\,tan}\dfrac{1}{x}, -\infty<x<0,\\ x^2+A, 0\le x<\infty.\end{cases}$

Variant 26. a) $f(x)=\dfrac{x^3-1}{x-1}2^{\frac{1}{x-2}}$, b) $f(x)=\begin{cases}\sin x, -\infty<x\le 2\pi,\\ Ax^2+3, 2\pi<x<\infty.\end{cases}$

Variant 27. a) $f(x)=\dfrac{\ln(1+x)}{x}e^{\frac{1}{x-1}}$, b) $f(x)=\begin{cases}\cos\dfrac{\pi}{2}x, -\infty<x\le -2,\\ Ax+4, -2<x<\infty.\end{cases}$

Variant 28. a) $f(x)=\dfrac{x^2-4}{x-2}2^{\frac{1}{x}}$, b) $f(x)=\begin{cases}\operatorname{arc\,tan}x, 0<x\le \dfrac{\pi}{4},\\ Ax+4, \dfrac{\pi}{4}<x<\infty.\end{cases}$

Variant 29. a) $f(x)=\dfrac{2^x-1}{x(x+2)}$, b) $f(x)=\begin{cases}3x, 0<x\le 1,\\ Ax^2-1, 1<x<\infty.\end{cases}$

Variant 30. a) $f(x)=\dfrac{\operatorname{arc\,tan}\dfrac{1}{x}}{x+3}$, b) $f(x)=\begin{cases}\ln x, 0<x\le e^2,\\ \dfrac{A}{x}+1, e^2<x<\infty.\end{cases}$

Variant 31. a) $f(x)=2^{\frac{1}{x}}\dfrac{\sin(x+1)}{x+1}$, b) $f(x)=\begin{cases}x-2,-\infty<x\le 0,\\ Ae^{\frac{x}{x+2}}, 0<x<\infty.\end{cases}$

Variant 32. a) $f(x)=\dfrac{\ln(1+x)}{x}e^{\frac{1}{x-1}}$, b) $f(x)=\begin{cases}\cos\dfrac{\pi}{2}x,-\infty<x\le -2,\\ Ax+4,-2<x<\infty.\end{cases}$

Variant 33. a) $f(x)=2^{\frac{x-1}{x^2-1}}$, b) $f(x)=\begin{cases}x^2+3,-4<x\le 3,\\ \dfrac{A}{x-3}, 3<x<\infty.\end{cases}$