

Задача 1

Вычислите предел, не используя правило Лопиталья (1 балл).

$$1.1. \lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{x^2 - 12x + 20}.$$

$$1.2. \lim_{x \rightarrow 0} \frac{x^3 - x^2 + 2x}{x^2 + x}.$$

$$1.3. \lim_{x \rightarrow 3} \frac{6 + x - x^2}{x^3 - 27}.$$

$$1.4. \lim_{x \rightarrow 1} \frac{2x^2 - x - 1}{3x^2 - x - 2}.$$

$$1.5. \lim_{x \rightarrow 2} \frac{2x^2 - 7x + 4}{x^2 - 5x + 6}.$$

$$1.6. \lim_{x \rightarrow 3} \frac{12 + x - x^2}{x^3 - 27}.$$

$$1.7. \lim_{x \rightarrow 1/3} \frac{3x^2 + 2x - 1}{27x^3 - 1}.$$

$$1.8. \lim_{x \rightarrow -1} \frac{x^2 - 4x - 5}{x^2 - 2x - 3}.$$

$$1.9. \lim_{x \rightarrow -1} \frac{3x^2 + 2x - 1}{-x^2 + x + 2}.$$

$$1.10. \lim_{x \rightarrow 3} \frac{3x^2 - 11x + 6}{2x^2 - 5x - 3}.$$

$$1.11. \lim_{x \rightarrow 2} \frac{x^3 - 8}{x^2 + x - 6}.$$

$$1.12. \lim_{x \rightarrow -1} \frac{x^2 - x - 2}{x^3 + 1}.$$

$$1.13. \lim_{x \rightarrow 4} \frac{x^2 - 16}{x^2 + x - 20}.$$

$$1.14. \lim_{x \rightarrow -3} \frac{4x^2 + 11x - 3}{x^2 + 2x - 3}.$$

$$1.15. \lim_{x \rightarrow 3} \frac{3x^2 - 7x - 6}{2x^2 - 7x + 3}.$$

$$1.16. \lim_{x \rightarrow -2} \frac{4x^2 + 7x - 2}{3x^2 + 8x + 4}.$$

$$1.17. \lim_{x \rightarrow -1} \frac{5x^2 + 4x - 1}{3x^2 + x - 2}.$$

$$1.18. \lim_{x \rightarrow -1} \frac{x^2 - 4x - 5}{3x^2 + 2x - 2}.$$

$$1.19. \lim_{x \rightarrow -1} \frac{7x^2 + 4x - 3}{2x^2 + 3x + 1}.$$

$$1.20. \lim_{x \rightarrow 4} \frac{3x^2 - 3x + 2}{x^2 - x - 12}.$$

$$1.21. \lim_{x \rightarrow 2} \frac{2x^2 - 9x + 10}{x^2 + 3x - 10}.$$

$$1.22. \lim_{x \rightarrow 1} \frac{4x^2 + x - 5}{x^2 - 2x + 1}.$$

$$1.23. \lim_{x \rightarrow 2} \frac{-5x^2 + 11x - 2}{3x^2 - x - 10}.$$

$$1.24. \lim_{x \rightarrow 7} \frac{x^2 - 5x - 14}{2x^2 - 9x - 35}.$$

$$1.25. \lim_{x \rightarrow 5} \frac{3x^2 - 6x - 45}{2x^2 - 3x - 35}.$$

$$1.26. \lim_{x \rightarrow -3} \frac{4x^2 + 3x + 15}{x^2 - 6x - 27}.$$

$$1.27. \lim_{x \rightarrow -5} \frac{x^2 - 2x - 35}{2x^2 + 11x + 5}.$$

$$1.28. \lim_{x \rightarrow -8} \frac{2x^2 + 15x - 8}{3x^2 + 25x + 8}.$$

$$1.29. \lim_{x \rightarrow 4} \frac{3x^2 - 2x - 40}{x^2 - 3x - 4}.$$

$$1.30. \lim_{x \rightarrow -3} \frac{2x^2 + 5x - 3}{3x^2 + 10x + 3}.$$

## Задача 2

Вычислите предел, не используя правило Лопиталья (1 балл).

$$2.1 \lim_{x \rightarrow \infty} \left( \frac{x+1}{x-1} \right)^{2x+3}$$

$$2.11 \lim_{x \rightarrow \infty} \left( \frac{8x+3}{8x-2} \right)^{\frac{x+1}{4}}$$

$$2.21 \lim_{x \rightarrow \infty} \left( \frac{x+3}{x+5} \right)^{x+4}$$

$$2.2 \lim_{x \rightarrow \infty} \left( \frac{2x^2+2}{2x^2+1} \right)^{x^2}$$

$$2.12 \lim_{x \rightarrow \infty} \left( \frac{x^3+1}{x^3-1} \right)^{2x-x^3}$$

$$2.22 \lim_{x \rightarrow \infty} \left( \frac{2x^2+5x+7}{2x^2+5x+3} \right)^x$$

$$2.3 \lim_{x \rightarrow \infty} \left( \frac{3x^2+4x-1}{3x^2+4x+7} \right)^{2x^2+5}$$

$$2.13 \lim_{x \rightarrow \infty} \left( \frac{10x-3}{10x-1} \right)^{\frac{5x+8}{4}}$$

$$2.23 \lim_{x \rightarrow \infty} \left( \frac{3x^2-6x+7}{3x^2-6x-1} \right)^{-x+1}$$

$$2.4 \lim_{x \rightarrow \infty} \left( \frac{3x^2-5x}{3x^2-5x+7} \right)^{x+1}$$

$$2.14 \lim_{x \rightarrow \infty} \left( \frac{1-3x}{7-3x} \right)^{x-2}$$

$$2.24 \lim_{x \rightarrow \infty} \left( \frac{x-1}{x+3} \right)^{x+2}$$

$$2.5 \lim_{x \rightarrow \infty} \left( \frac{x^2+3}{x^2+1} \right)^{-x^2}$$

$$2.15 \lim_{x \rightarrow \infty} \left( \frac{7x-3}{7x-2} \right)^{3x+1}$$

$$2.25 \lim_{x \rightarrow \infty} \left( \frac{5x^2+3x-1}{5x^2+3x+3} \right)^{5x}$$

$$2.6 \lim_{x \rightarrow \infty} \left( \frac{6x-7}{6x+4} \right)^{3x+2}$$

$$2.16 \lim_{x \rightarrow \infty} \left( \frac{x^2+18}{x^2-2} \right)^{2x^2+3}$$

$$2.26 \lim_{x \rightarrow \infty} \left( \frac{x^2+x+1}{x^2+x-1} \right)^{-x+8}$$

$$2.7 \lim_{x \rightarrow \infty} \left( \frac{x^2-3x+6}{x^2-3x+1} \right)^{\frac{x}{2}}$$

$$2.17 \lim_{x \rightarrow \infty} \left( \frac{x+4}{x+2} \right)^{\frac{5x-1}{2}}$$

$$2.27 \lim_{x \rightarrow \infty} \left( \frac{x^2-1}{x^2+10} \right)^{x^2+8}$$

$$2.8 \lim_{x \rightarrow \infty} \left( \frac{x^2-5x+5}{x^2-5x+6} \right)^{3x+2}$$

$$2.18 \lim_{x \rightarrow \infty} \left( \frac{2x^2+18x-7}{2x^2+18x+9} \right)^{2x^2}$$

$$2.28 \lim_{x \rightarrow \infty} \left( \frac{2x+3}{2x+1} \right)^{\frac{x+1}{4}}$$

$$2.9 \lim_{x \rightarrow \infty} \left( \frac{x^2+8x-3}{x^2+8x+2} \right)^{5x^2+4}$$

$$2.19 \lim_{x \rightarrow \infty} \left( \frac{x-1}{x+1} \right)^{\frac{x-7}{3}}$$

$$2.29 \lim_{x \rightarrow \infty} \left( \frac{2x^2+7x-1}{2x^2+7x-1} \right)^{-x^2}$$

$$2.10 \lim_{x \rightarrow \infty} \left( \frac{7x^2+11x-3}{7x^2+11x-2} \right)^{x^2+1}$$

$$2.20 \lim_{x \rightarrow \infty} \left( \frac{3x+1}{3x-1} \right)^{2x+3}$$

$$2.30 \lim_{x \rightarrow \infty} \left( \frac{x-10}{x+1} \right)^{3x+1}$$

### Задача 3

Вычислите предел, не используя правило Лопиталя (1 балл).

$$3.1. \lim_{x \rightarrow \infty} \frac{3x^3 - 5x^2 + 2}{2x^3 + 5x^2 - x}.$$

$$3.2. \lim_{x \rightarrow \infty} \frac{4x^3 + 7x}{2x^3 - 4x^2 + 5}.$$

$$3.3. \lim_{x \rightarrow \infty} \frac{5x^4 - 3x^2 + 7}{x^4 + 2x^3 + 1}.$$

$$3.4. \lim_{x \rightarrow \infty} \frac{7x^3 - 2x^2 + 4x}{2x^3 + 5}.$$

$$3.5. \lim_{x \rightarrow \infty} \frac{x^3 - 4x^2 + 28x}{5x^3 + 3x^2 + x - 1}.$$

$$3.6. \lim_{x \rightarrow \infty} \frac{3x^2 + 10x + 3}{2x^2 + 5x - 3}.$$

$$3.7. \lim_{x \rightarrow \infty} \frac{-3x^4 + x^2 + x}{x^4 + 3x - 2}.$$

$$3.8. \lim_{x \rightarrow \infty} \frac{2x^2 + 7x + 3}{5x^2 - 3x + 4}.$$

$$3.9. \lim_{x \rightarrow \infty} \frac{-x^2 + 3x + 1}{3x^2 + x - 5}.$$

$$3.10. \lim_{x \rightarrow \infty} \frac{x^3 - 3x^2 + 10}{7x^3 + 2x + 1}.$$

$$3.11. \lim_{x \rightarrow \infty} \frac{4x^2 + 5x - 7}{2x^2 - x + 10}.$$

$$3.12. \lim_{x \rightarrow \infty} \frac{3x^4 + 2x + 1}{x^4 - x^3 + 2x}.$$

$$3.13. \lim_{x \rightarrow \infty} \frac{3x^2 + 2x + 9}{2x^2 - x + 4}.$$

$$3.14. \lim_{x \rightarrow \infty} \frac{3x^2 + 5x - 7}{3x^2 + x + 1}.$$

$$3.15. \lim_{x \rightarrow \infty} \frac{2x^3 + 7x - 2}{3x^3 - x - 4}.$$

$$3.16. \lim_{x \rightarrow 0} \frac{18x^2 + 5x}{8 - 3x - 9x^2}.$$

$$3.17. \lim_{x \rightarrow \infty} \frac{3x^4 - 6x^2 + 2}{x^4 + 4x - 3}.$$

$$3.18. \lim_{x \rightarrow \infty} \frac{8x^2 + 4x - 5}{4x^2 - 3x + 2}.$$

$$3.19. \lim_{x \rightarrow \infty} \frac{8x^4 - 4x^2 + 3}{2x^4 + 1}.$$

$$3.20. \lim_{x \rightarrow \infty} \frac{3x^2 - 4x + 2}{6x^2 + 5x + 1}.$$

$$3.21. \lim_{x \rightarrow \infty} \frac{7x^3 + 4x}{x^3 - 3x + 2}.$$

$$3.22. \lim_{x \rightarrow \infty} \frac{1 + 4x - x^4}{x + 3x^2 + 2x^4}.$$

$$3.23. \lim_{x \rightarrow \infty} \frac{2x^3 + 7x^2 - 2}{6x^3 - 4x + 3}.$$

$$3.24. \lim_{x \rightarrow \infty} \frac{3x + 14x^2}{1 + 2x + 7x^2}.$$

$$3.25. \lim_{x \rightarrow \infty} \frac{x - 2x^2 + 5x^4}{2 + 3x^2 + x^4}.$$

$$3.26. \lim_{x \rightarrow \infty} \frac{3x^4 - 2x^2 - 7}{3x^4 + 3x + 5}.$$

$$3.27. \lim_{x \rightarrow \infty} \frac{4 - 5x^2 - 3x^5}{x^5 + 6x + 8}.$$

$$3.28. \lim_{x \rightarrow \infty} \frac{5x^3 - 7x^2 + 3}{2 + 2x - x^3}.$$

$$3.29. \lim_{x \rightarrow \infty} \frac{4x^3 - 2x + 1}{2x^3 + 3x^2 + 2}.$$

$$3.30. \lim_{x \rightarrow \infty} \frac{5x^2 - 3x + 1}{3x^2 + x - 5}.$$

### Задача 4

Вычислите предел, не используя правило Лопиталя (2 балла).

$$4.1 \lim_{x \rightarrow 0} \frac{1 - \sqrt{3x+1}}{\cos\left(\frac{\pi}{2}(x+1)\right)}$$

$$4.2 \lim_{x \rightarrow 0} \frac{2 \sin(\pi(x+1))}{\ln(1+2x)}$$

$$4.3 \lim_{x \rightarrow 0} \frac{\sin^2 x - \operatorname{tg}^2 x}{x^4}$$

$$4.4 \lim_{x \rightarrow 0} \frac{e^{2x} - 1}{\operatorname{ctg}\left(\frac{\pi}{2}(x+1)\right)}$$

$$4.5 \lim_{x \rightarrow 0} \frac{1 - \sqrt{\cos x}}{x \sin x}$$

$$4.6 \lim_{x \rightarrow 0} \frac{\sin 7x}{x^2 + \pi x}$$

$$4.7 \lim_{x \rightarrow 0} \frac{\sin^2 5x}{x \operatorname{tg}(\pi(x+1))}$$

$$4.8 \lim_{x \rightarrow 0} \frac{\ln(1-7x)}{\sin(\pi(x+7))}$$

$$4.9 \lim_{x \rightarrow 0} \frac{\arcsin^2 2x}{(2^{-3x} - 1) \operatorname{tg} x} \cdot \ln 2$$

$$4.1) \lim_{x \rightarrow 0} \frac{e^{4x} - 1}{\sin\left(\pi\left(\frac{x}{2} + 1\right)\right)}$$

$$4.11 \lim_{x \rightarrow 0} \frac{\cos^2 3x - 1}{\ln(1-3x^2)}$$

$$4.12 \lim_{x \rightarrow 0} \frac{\sin^2(\pi(x+2))}{1 - \cos 2x}$$

$$4.13 \lim_{x \rightarrow 0} \frac{\arcsin^2(6x^2)}{\sqrt{x^4 + 1} - 1}$$

$$4.14 \lim_{x \rightarrow 0} \frac{1 - \cos x}{(e^{3x} - 1)^2}$$

$$4.15 \lim_{x \rightarrow 0} \frac{\operatorname{arctg} 2x}{\sin(2\pi(x+10))}$$

$$4.16 \lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{\sin(\pi(x+2))}$$

$$4.17 \lim_{x \rightarrow 0} \frac{\sin(5(x+\pi))}{e^{3x} - 1}$$

$$4.18 \lim_{x \rightarrow 0} \frac{\cos 2x - \cos x}{1 - \cos x}$$

$$4.19 \lim_{x \rightarrow 0} \frac{\sqrt{4+x} - 2}{3 \operatorname{arctg} x}$$

$$4.20 \lim_{x \rightarrow 0} \frac{9 \ln(1-2x)}{4 \operatorname{arctg} 3x}$$

$$4.21 \lim_{x \rightarrow 0} \frac{\cos\left(x + \frac{5}{2}\pi\right) \operatorname{tg} x}{\arcsin 2x^2}$$

$$4.22 \lim_{x \rightarrow 0} \frac{2^x - 1}{\ln(1-2x)}$$

$$4.23 \lim_{x \rightarrow 0} \frac{\arcsin 3x}{\sqrt{2+x} - \sqrt{2}}$$

$$4.24 \lim_{x \rightarrow 0} \frac{1 - \cos^3 x}{4x^2}$$

$$4.25 \lim_{x \rightarrow 0} \frac{4x}{\operatorname{tg}(\pi(2+x))}$$

$$4.26 \lim_{x \rightarrow 0} \frac{2x}{\operatorname{tg}\left(2\pi\left(x + \frac{1}{2}\right)\right)}$$

$$4.27 \lim_{x \rightarrow 0} \frac{1 - \cos 2x}{\cos 7x - \cos 3x}$$

$$4.28 \lim_{x \rightarrow 0} \frac{3x^2 - 5x}{\sin 3x}$$

$$4.29 \lim_{x \rightarrow 0} \frac{1 - \cos 10x}{e^{x^2} - 1}$$

$$4.30 \lim_{x \rightarrow 0} \frac{\ln(1 + \sin^2 x)}{\sin^2 4x}$$