15. Функцияның жоғарғы ретті дифференциалының формуласын жазыңыз. Мысал келтіріңіз.
16. Туындылары бар болатын функциялар туралы Ферма, Ролль, Коши, Лагранж теоремаларын тұжырымдаңыз және олардың геометриялық мағыналарын түсіндіріңіз.
17. Туындылары берілген аралықта оң, теріс, нөл болатын функциялардың сипаты туралы теоремаларды тұжырымдаңыз. Мысал келтіріңіз.
18. Лопиталь ережесі туралы теореманы тұжырымдаңыз және оны мысалдар арқылы $0 \cdot \infty$, 0^0, $\infty - \infty$, 1^∞ және т.с.с. анықталмағандықтарды ашуға қалай қолдануға болатынын көрсетіңіз.
19. Қалдық мүшесі Пеано түріндегі және қалдық мүшесі Лагранж түріндегі Тейлор формулаларын жазыңыз. Қандай жағдайда бұл формулалар Маклорен формулалары деп аталады?
20. Кейбір негізгі элементар функциялар үшін Маклорен формулаларын келтіріңіз.

5.1-YT
Берілген функцияларды дифференциалдау керек

1.

1.1. $y = 2x^5 - \dfrac{4}{x^3} + \dfrac{1}{x} + 3\sqrt{x}.$

1.2. $y = \dfrac{3}{x} + \sqrt[5]{x^2} - 4x^3 + \dfrac{2}{x^4}.$

1.3. $y = 3x^4 + \sqrt[3]{x^5} - \dfrac{2}{x} - \dfrac{4}{x^2}.$

1.4. $y = 7\sqrt{x} - \dfrac{2}{x^5} - 3x^3 + \dfrac{4}{x}.$

1.5. $y = 7x + \dfrac{5}{x^2} - \sqrt[7]{x^4} + \dfrac{6}{x}.$

1.6. $y = 5x^2 - \sqrt[3]{x^4} + \dfrac{4}{x^3} - \dfrac{5}{x}.$

1.7. $y = 3x^5 - \dfrac{3}{x} - \sqrt{x^3} + \dfrac{10}{x^5}.$

1.8. $y = \sqrt[3]{x^7} + \dfrac{3}{x} - 4x^6 + \dfrac{4}{x^5}.$

1.9. $y = 8x^2 + \sqrt[3]{x^4} - \dfrac{4}{x} - \dfrac{2}{x^3}.$

1.10. $y = 4x^6 + \dfrac{5}{x} - \sqrt[3]{x^7} - \dfrac{7}{x^4}.$

1.11. $y = 2\sqrt{x^3} - \dfrac{7}{x} + 3x^2 - \dfrac{2}{x^5}.$ **1.12.** $y = 4x^3 - \dfrac{3}{x} - \sqrt[5]{x^2} + \dfrac{6}{x^2}.$

1.13. $y = 5x^3 - \dfrac{8}{x^2} + 4\sqrt{x} + \dfrac{1}{x}.$ **1.14.** $y = \dfrac{9}{x^3} + \sqrt[3]{x^4} - \dfrac{2}{x} + 5x^4.$

1.15. $y = \dfrac{4}{x^5} - \dfrac{9}{x} + \sqrt[5]{x^2} - 7x^3.$ **1.16.** $y = \dfrac{8}{x^3} + \dfrac{3}{x} - 4\sqrt{x^3} + 2x^7.$

1.17. $y = 5x^2 + \dfrac{4}{x} - \sqrt[3]{x^7} - 2x^6.$ **1.18.** $y = 10x^2 + 3\sqrt{x^5} - \dfrac{4}{x} - \dfrac{5}{x^4}.$

1.19. $y = \sqrt{x^5} - \dfrac{3}{x} + \dfrac{4}{x^3} - 3x^3.$ **1.20.** $y = 9x^3 + \dfrac{5}{x} - \dfrac{7}{x^4} + \sqrt[3]{x^7}.$

1.21. $y = 3\sqrt{x} + \dfrac{4}{x^5} + \sqrt[3]{x^2} - \dfrac{7}{x}.$ **1.22.** $y = \sqrt{x^3} + \dfrac{2}{x} - \dfrac{4}{x^5} - 5x^3.$

1.23. $y = 7x^2 + \dfrac{3}{x} - \sqrt[5]{x^4} + \dfrac{8}{x^3}.$ **1.24.** $y = 8x^3 - \dfrac{4}{x} - \dfrac{7}{x^4} + \sqrt[7]{x^2}.$

1.25. $y = 8x - \dfrac{5}{x^4} + \dfrac{1}{x} - \sqrt[5]{x^4}.$ **1.26.** $y = \sqrt[4]{x^3} - \dfrac{5}{x} + \dfrac{4}{x^5} + 3x.$

1.27. $y = 4x^3 + \dfrac{3}{x} - \sqrt[3]{x^5} - \dfrac{2}{x^4}.$ **1.28.** $y = 4x^5 - \dfrac{5}{x} - \sqrt{x^3} + \dfrac{2}{x^3}.$

1.29. $y = \dfrac{7}{x} + \dfrac{4}{x^3} - \sqrt[5]{x^3} - 2x^6.$ **1.30.** $y = \dfrac{6}{x^4} - \dfrac{3}{x} + 3x^3 - \sqrt{x^7}.$

2.

2.1. $y = \sqrt[3]{3x^4 + 2x - 5} + \dfrac{4}{(x-2)^5}.$ **2.2.** $y = \sqrt[3]{(x-3)^4} - \dfrac{3}{2x^3 - 3x + 1}.$

2.3. $y = \sqrt{(x-4)^5} + \dfrac{5}{2x^2 + 4x - 1}.$ **2.4.** $y = \sqrt[5]{7x^2 - 3x + 5} - \dfrac{5}{(x-1)^3}.$

2.5. $y = \sqrt[4]{3x^2 - x + 5} + \dfrac{3}{(x-5)^4}.$ **2.6.** $y = \sqrt{3x^4 - 2x^3 + x} - \dfrac{4}{(x+2)^3}.$

2.7. $y = \sqrt[3]{(x-7)^5} + \dfrac{5}{4x^2 + 3x - 5}.$ **2.8.** $y = \sqrt[5]{(x+4)^6} - \dfrac{2}{2x^2 - 3x + 7}.$

2.9. $y = \dfrac{3}{(x-4)^7} - \sqrt{5x^2 - 4x + 3}.$ **2.10.** $y = \sqrt[3]{4x^2 - 3x - 4} - \dfrac{3}{(x-3)^5}.$

2.11. $y = \dfrac{7}{(x-1)^3} + \sqrt{8x - 3 + x^2}.$ **2.12.** $y = \sqrt[5]{3x^2 + 4x - 5} + \dfrac{4}{(x-4)^4}.$

2.13. $y = \sqrt[3]{5x^4 - 2x - 1} + \dfrac{8}{(x-5)^2}.$ **2.14.** $y = \dfrac{3}{(x+2)^5} - \sqrt[7]{5x - 7x^2 - 3}.$

2.15. $y = \sqrt[4]{(x-1)^5} - \dfrac{4}{7x^2 - 3x + 2}.$ **2.16.** $y = \sqrt[5]{(x-2)^6} - \dfrac{3}{7x^3 - x^2 - 4}.$

2.17. $y = \dfrac{3}{(x+4)^2} - \sqrt[3]{4 + 3x - x^4}.$ **2.18.** $y = \dfrac{2}{(x-1)^3} - \dfrac{8}{6x^2 + 3x - 7}.$

2.19. $y = \sqrt{1 + 5x - 2x^2} + \dfrac{3}{(x-3)^4}.$ **2.20.** $y = \sqrt[3]{5 + 4x - x^2} - \dfrac{5}{(x+1)^3}.$

2.21. $y = \sqrt[4]{5x^2 - 4x + 1} - \dfrac{7}{(x-5)^2}.$ **2.22.** $y = \sqrt[5]{3 - 7x + x^2} - \dfrac{4}{(x-7)^5}.$

2.23. $y = \sqrt{(x-3)^7} + \dfrac{9}{7x^2 - 5x - 8}.$ **2.24.** $y = \sqrt[3]{(x-8)^4} - \dfrac{2}{1 + 3x - 4x^2}.$

2.25. $y = \dfrac{3}{4x - 3x^2 + 1} - \sqrt{(x+1)^5}.$ **2.26.** $y = \dfrac{3}{x-4} + \sqrt[6]{(2x^2 - 3x + 1)^5}.$

2.27. $y = \dfrac{4}{(x-7)^3} - \sqrt[3]{(3x^2 - x + 1)^4}.$ **2.28.** $y = \sqrt{(x-4)^7} - \dfrac{10}{3x^2 - 5x + 1}.$

2.29. $y = \dfrac{7}{(x+2)^5} - \sqrt{8 - 5x + 2x^2}.$ **2.30.** $y = \sqrt[3]{(x-1)^5} + \dfrac{5}{2x^2 - 4x + 7}.$

3.

3.1. $y = \sin^3 2x \cdot \cos 8x^5.$ **3.2.** $y = \cos^5 3x \cdot tg(4x+1)^3.$

3.3. $y = \mathrm{tg}^4\, x \cdot \arcsin 4x^5.$

3.4. $y = \arcsin^3 2x \cdot \mathrm{ctg}\, 7x^4.$

3.5. $y = \mathrm{ctg}\, 3x \cdot \arccos 3x^2.$

3.6. $y = \arccos^2 4x \cdot \ln(x-3).$

3.7. $y = \ln^5 x \cdot \mathrm{arctg}\, 7x^4.$

3.8. $y = \mathrm{arctg}^3\, 4x \cdot 3^{\sin x}.$

3.9. $y = 2^{\cos x} \cdot \mathrm{arcctg}\, 5x^3.$

3.10. $y = 4^{-x} \cdot \ln^5(x+2).$

3.11. $y = 3^{tgx} \cdot \arcsin 7x^4.$

3.12. $y = 5^{x^2} \cdot \arccos 2x^5.$

3.13. $y = \sin^4 3x \cdot \mathrm{arctg}\, 2x^3.$

3.14. $y = \cos^3 4x \cdot \mathrm{arcctg}\, \sqrt{x}.$

3.15. $y = \mathrm{tg}^3\, 2x \cdot \arcsin x^5.$

3.16. $y = \mathrm{ctg}^7\, x \cdot \arccos 2x^3.$

3.17. $y = e^{-\sin x} \cdot \mathrm{tg}\, 7x^6.$

3.18. $y = e^{\cos x} \cdot \mathrm{ctg}\, 8x^3.$

3.19. $y = \cos^5 x \cdot \arccos 4x.$

3.20. $y = \sin^3 7x \cdot \mathrm{arcctg}\, 5x^2.$

3.21. $y = \sin^2 3x \cdot \mathrm{arcctg}\mathrm{x}^5.$

3.22. $y = \cos \sqrt[5]{x} \cdot \mathrm{arctg}\, x^4.$

3.23. $y = \mathrm{tg}^6\, 2x \cdot \cos 7x^2.$

3.24. $y = \mathrm{ctg}^3\, 4x \cdot \arcsin \sqrt{x}.$

3.25. $y = \mathrm{ctg}\dfrac{1}{x} \cdot \arccos x^4.$

3.26. $y = \mathrm{tg}\, \sqrt{x} \cdot \mathrm{arcctg}\, 3x^5.$

3.27. $y = \mathrm{tg}^3\, 2x \cdot \arccos 2x^3.$

3.28. $y = 2^{tgx} \cdot \mathrm{arctg}^5\, 3x.$

3.29. $y = \sin^5 3x \cdot \mathrm{arctg}\, \sqrt{x}.$

3.30. $y = \cos^4 3x \cdot \arcsin 3x^2.$

4.

4.1. $y = \mathrm{arcctg}^2\, 5x \cdot \ln(x-4).$

4.2. $y = \mathrm{arctg}^3\, 2x \cdot \ln(x+5).$

4.3. $y = \arccos^4 x \cdot \ln(x^2+x-1).$

4.4. $y = \sqrt{\arccos 2x} \cdot 3^{-x}.$

4.5. $y = \mathrm{tg}^4\, 3x \cdot \mathrm{arctg}\, 7x^2.$

4.6. $y = 5^{-x^2} \cdot \arcsin 3x^3.$

4.7. $y = \mathrm{arctg}^5\, x \cdot \log_2(x-3).$

4.8. $y = \log_3(x+5) \cdot \arccos 3x.$

4.9. $y = e^{-x} \cdot \arcsin^2 5x.$

4.10. $y = \log_4(x-1) \cdot \arcsin^4 x.$

4.11. $y = (x-4)^5 \cdot \mathrm{arcctg}\, 3x^2.$

4.12. $y = \mathrm{ctg}^3\, 4x \cdot \mathrm{arctg}\, 2x^3.$

4.13. $y = e^{-\cos x} \cdot \operatorname{arctg} 7x^5$.

4.14. $y = (x+1)^5 \cdot \arccos 3x^4$.

4.15. $y = 2^{\sin x} \cdot \operatorname{arcctg} x^4$.

4.16. $y = 3^{-x^3} \cdot \operatorname{arctg} 2x^5$.

4.17. $y = 3^{\cos x} \cdot \arcsin^2 3x$.

4.18. $y = \ln(x-10) \cdot \arccos^2 4x$.

4.19. $y = \lg(x-2) \cdot \arcsin^5 x$.

4.20. $y = \log_3(x+1) \cdot arctg^5 7x$.

4.21. $y = \ln(x+9) \cdot \operatorname{arcctg}^3 2x$.

4.22. $y = \lg(x+2) \cdot \arcsin^2 3x$.

4.23. $y = 4^{-\sin x} \cdot \operatorname{arctg} 3x$.

4.24. $y = 2^{\cos x} \cdot \operatorname{arcctg}^3 x$.

4.25. $y = \lg(x-3) \cdot \arcsin^2 5x$.

4.26. $y = \log_2(x+3) \cdot \arccos^2 x$.

4.27. $y = 2^{-x} \cdot \operatorname{arctg}^3 4x$.

4.28. $y = \ln(x-4) \cdot \operatorname{arcctg}^4 3x$.

4.29. $y = \lg(x+3) \cdot \operatorname{arcctg}^2 5x$.

4.30. $y = \log_5(x+1) \cdot \operatorname{arctg}^2 x^3$.

5.

5.1. $y = \operatorname{tg}^4 3x \cdot \arcsin 2x^3$.

5.2. $y = (x-2)^4 \cdot \arcsin 5x^4$.

5.3. $y = 2^{-x^3} \cdot \operatorname{arctg} 7x^4$.

5.4. $y = (x+6)^6 \cdot \operatorname{arcctg} 3x^5$.

5.5. $y = 3^{\cos x} \cdot \ln(x^2 - 3x + 7)$.

5.6. $y = \log_2(x-7) \cdot \operatorname{arctg} \sqrt{x}$.

5.7. $y = \arccos^3 5x \cdot \operatorname{tg} x^4$.

5.8. $y = (x-5)^7 \cdot \operatorname{arcctg} 7x^3$.

5.9. $y = \arccos x^2 \cdot \operatorname{ctg} 7x^3$.

5.10. $y = 5^{-x^2} \cdot \arccos 5x^4$.

5.11. $y = \operatorname{arctg}^4 x \cdot \cos 7x^4$.

5.12. $y = 4(x-7)^6 \cdot \arcsin 3x^5$.

5.13. $y = (x+5)^2 \cdot \arccos^3 5x$.

5.14. $y = 2^{-\sin x} \cdot \arcsin^3 2x$.

5.15. $y = (x+2)^7 \cdot \arccos \sqrt{x}$.

5.16. $y = (x-7)^5 \cdot \arcsin 7x^4$.

5.17. $y = \ln(x-3) \cdot \arccos 3x^4$.

5.18. $y = \log_2(x-4) \cdot \operatorname{arctg}^3 4x$.

5.19. $y = (x-7)^4 \cdot \operatorname{arcctg}^2 7x$.

5.20. $y = \sqrt[3]{x-3} \cdot \arccos^4 2x$.

5.21. $y = \sqrt[3]{x-4} \cdot \arcsin^4 5x$.

5.22. $y = (x-3)^2 \cdot \arccos 3x^6$.

5.23. $y = \sqrt{(x+4)^5} \cdot \arcsin 2x^3.$

5.24. $y = \sqrt[3]{(x+1)^2} \cdot \arccos 3x.$

5.25. $y = tg^3 x \cdot \operatorname{arcctg} 3x.$

5.26. $y = \sqrt{(x-2)^3} \cdot \operatorname{arctg}(7x-1).$

5.27. $y = \sqrt[5]{(x+4)^2} \cdot \arcsin 7x^2.$

5.28. $y = \arcsin^3 4x \cdot \operatorname{ctg} 3x.$

5.29. $y = e^{-\cos x} \cdot \arcsin 2x.$

5.30. $y = \sqrt{(x+5)^3} \cdot \arccos^4 x.$

6.

6.1. $y = (x-3)^4 \cdot \arccos 5x^3.$

6.2. $y = (3x-4)^3 \cdot \arccos 3x^2.$

6.3. $y = sh^3 4x \cdot \arccos \sqrt{x}.$

6.4. $y = th^2 \sqrt{x} \cdot \operatorname{arcctg} 3x^2.$

6.5. $y = \operatorname{cth}^3 5x \cdot \arcsin 3x^2.$

6.6. $y = \operatorname{ch}\left(\dfrac{1}{x}\right) \cdot \operatorname{arctg}(7x+2).$

6.7. $y = \operatorname{ch}^3 4x \cdot \arccos 4x^2.$

6.8. $y = sh^2 3x \cdot \operatorname{arcctg} 5x^2.$

6.9. $y = th^5 3x \cdot \arcsin \sqrt{x}.$

6.10. $y = \operatorname{cth}^2(x+1) \cdot \arccos\left(\dfrac{1}{x}\right).$

6.11. $y = sh^4 2x \cdot \arccos x^2.$

6.12. $y = \operatorname{ch}^3(3x+2) \cdot \operatorname{arctg} 3x.$

6.13. $y = th^3 4x \cdot \operatorname{arcctg} 3x^4.$

6.14. $y = \operatorname{cth}^4 7x \cdot \arcsin \sqrt{x}.$

6.15. $y = sh^3 2x \cdot \arcsin 7x^2.$

6.16. $y = th^5 4x \cdot \arccos 3x^4.$

6.17. $y = \operatorname{ch}^2 5x \cdot \operatorname{arctg} \sqrt{x}.$

6.18. $y = \operatorname{cth}^4 2x \cdot \operatorname{arctg} x^3.$

6.19. $y = sh^4 5x \cdot \arccos 3x^2.$

6.20. $y = \operatorname{ch}^3 9x \cdot \operatorname{arctg}(5x-1).$

6.21. $y = th^4 x \cdot \operatorname{arcctg}\left(\dfrac{1}{x}\right).$

6.22. $y = \operatorname{cth}^3 4x \cdot \arcsin(3x+1).$

6.23. $y = \operatorname{ch}^2 5x \cdot \operatorname{arctg} x^4.$

6.24. $y = th^4 7x \cdot \arccos x^3.$

6.25. $y = \operatorname{cth} 4x^5 \cdot \arccos 2x.$

6.26. $y = \operatorname{cth} 3x \cdot \arcsin^4 2x.$

6.27. $y = th^5 3x \cdot \operatorname{arcctg} \sqrt{x}.$

6.28. $y = sh^4 3x \cdot \arccos 5x^4.$

6.29. $y = \operatorname{cth}^2 4x \cdot \arcsin x^3.$ **6.30.** $y = \operatorname{th}^3 5x \cdot \operatorname{arcctg}(2x-5).$

7.

7.1. $y = \dfrac{e^{\arccos^3 x}}{\sqrt{x+5}}.$

7.2. $y = \dfrac{(x-4)^2}{e^{\operatorname{arcctg} x}}.$

7.3. $y = \dfrac{e^{-x^3}}{\sqrt{x^2+5x-1}}.$

7.4. $y = \dfrac{e^{-\operatorname{ctg} x}}{3x^2-4x+2}.$

7.5. $y = \dfrac{\sqrt{7x^3-5x+2}}{e^{\cos x}}.$

7.6. $y = \dfrac{e^{\operatorname{tg} 3x}}{\sqrt{3x^2-x+4}}.$

7.7. $y = \dfrac{e^{\sin x}}{(x-5)^7}.$

7.8. $y = \dfrac{\sqrt[3]{2x^2-3x+1}}{e^{-x}}.$

7.9. $y = \dfrac{\sqrt{x^3+4x-5}}{e^{x^3}}.$

7.10. $y = \dfrac{e^{\operatorname{ctg} 5x}}{(x+4)^3}.$

7.11. $y = \dfrac{\sqrt{3+2x-x^2}}{e^x}.$

7.12. $y = \dfrac{e^{3x}}{\sqrt{3x^2-x-7}}.$

7.13. $y = \dfrac{e^{-\sin 2x}}{(x+5)^4}.$

7.14. $y = \dfrac{e^{\cos 5x}}{\sqrt{x^2-5x-2}}.$

7.15. $y = \dfrac{(2x+5)^3}{e^{\operatorname{tg} x}}.$

7.16. $y = \dfrac{e^{-\operatorname{tg} 3x}}{4x^2-3x+5}.$

7.17. $y = \dfrac{e^{-\sin 4x}}{(2x-5)^6}.$

7.18. $y = \dfrac{3x^2-5x+10}{e^{-x^4}}.$

7.19. $y = \dfrac{e^{-x}}{(2x^2-x+4)^2}.$

7.20. $y = \dfrac{e^{4x}}{(3x+5)^3}.$

7.21. $y = \dfrac{e^{\operatorname{ctg} 5x}}{(3x-5)^4}.$

7.22. $y = \dfrac{(2x-3)^7}{e^{-2x}}.$

7.23. $y = \dfrac{(3x+1)^4}{e^{4x}}.$

7.24. $y = \dfrac{5x^2 + 4x - 2}{e^{-x}}.$

7.25. $y = \dfrac{\sqrt{5x^2 - x + 1}}{e^{3x}}.$

7.26. $y = \dfrac{e^{-x^2}}{(2x-5)^7}.$

7.27. $y = \dfrac{e^{\cos 3x}}{(2x+4)^5}.$

7.28. $y = \dfrac{e^{\sin 5x}}{(3x-2)^2}.$

7.29. $y = \dfrac{\sqrt{x^2 - 3x - 7}}{e^{-x^3}}.$

7.30. $y = \dfrac{e^{-tgx}}{4x^2 + 7x - 5}.$

8.

8.1. $y = \dfrac{\log_5(3x-7)}{ctg\,7x^3}.$

8.2. $y = \dfrac{\ln(5x-3)}{4\,tg\,3x^4}.$

8.3. $y = \dfrac{\ln(7x+2)}{5\cos 42x}.$

8.4. $y = \dfrac{\sin^3 5x}{\ln(2x-3)}.$

8.5. $y = \dfrac{\cos^2 3x}{\lg(3x-4)}.$

8.6. $y = \dfrac{tg^3 2x}{\lg(5x+1)}.$

8.7. $y = \dfrac{\log_3(4x+5)}{2\,ctg\sqrt{x}}.$

8.8. $y = \dfrac{\ln(7x-3)}{3\,tg^2 4x}.$

8.9. $y = \dfrac{\lg(11x+3)}{\cos^2 5x}.$

8.10. $y = \dfrac{ctg^2 5x}{\ln(7x-2)}.$

8.11. $y = \dfrac{tg^2(x-2)}{\lg(x+3)}.$

8.12. $y = \dfrac{\sin^3(5x+1)}{\lg(3x-2)}.$

8.13. $y = \dfrac{\cos^4(7x-1)}{\lg(x+5)}.$

8.14. $y = \dfrac{\sin^3(4x+3)}{\ln(7x+1)}.$

8.15. $y = \dfrac{\operatorname{ctg}^3(2x-3)}{\log_3(x+2)}.$

8.16. $y = \dfrac{\lg^3 x}{\sin 5x^2}.$

8.17. $y = \dfrac{\ln^2(x+1)}{\cos 3x^4}.$

8.18. $y = \dfrac{\log_2(7x-5)}{\operatorname{tg}\sqrt{x}}.$

8.19. $y = \dfrac{\log_3(4x-2)}{\operatorname{ctg} 2x}.$

8.20. $y = \dfrac{\ln^3(x-5)}{\operatorname{tg}\left(\dfrac{1}{x}\right)}.$

8.21. $y = \dfrac{\lg(x+1)}{\sin 2x^5}.$

8.22. $y = \dfrac{\operatorname{tg}^3 7x}{\ln(3x+2)}.$

8.23. $y = \dfrac{\operatorname{ctg}\sqrt{x-2}}{\lg(3x+5)}.$

8.24. $y = \dfrac{\operatorname{tg}(3x+7)}{\operatorname{tg} 3x}.$

8.25. $y = \dfrac{\cos^2 x}{\lg(x^2-2x+1)}.$

8.26. $y = \dfrac{\log_2(3x+7)}{\operatorname{tg} 3x}.$

8.27. $y = \dfrac{\ln^3 x}{\operatorname{ctg}(x-3)}.$

8.28. $y = \dfrac{\operatorname{tg}^4 5x}{\ln(x+7)}.$

8.29. $y = \dfrac{\log_3(x+4)}{\cos^5 x}.$

8.30. $y = \dfrac{\operatorname{tg}^4 3x}{\lg(x^2-x+4)}.$

9.

9.1. $y = \dfrac{\operatorname{arcctg}^4 5x}{\operatorname{sh}\sqrt{x}}.$

9.2. $y = \dfrac{\operatorname{arctg}^3 2x}{\operatorname{ch}\left(\dfrac{1}{x}\right)}.$

9.3. $y = \dfrac{\arccos 3x^4}{\operatorname{th}^2 x}.$

9.4. $y = \dfrac{\arcsin 5x^3}{\operatorname{ch}\sqrt{x}}.$

9.5. $y = \dfrac{\operatorname{cth}^3(x+1)}{\arccos 2x}.$

9.6. $y = \dfrac{\operatorname{th} 3x^5}{\operatorname{arctg}^2 3x}.$

9.7. $y = \dfrac{\arccos^7 2x}{\operatorname{th} x^5}.$

9.8. $y = \dfrac{\arcsin^3 4x}{\operatorname{sh}(3x+1)}.$

9.9. $y = \dfrac{\operatorname{th}^4(2x+5)}{\arccos 3x}.$

9.10. $y = \dfrac{\sqrt[3]{\operatorname{arctg} 2x}}{\operatorname{sh}^2 x}.$

9.11. $y = \dfrac{\arcsin^2 4x}{\operatorname{th}(5x-3)}.$

9.12. $y = \dfrac{\operatorname{ch}^2(4x+2)}{\operatorname{arctg} x^3}.$

9.13. $y = \dfrac{\arcsin 4x^5}{\operatorname{th}^3 x}.$

9.14. $y = \dfrac{\operatorname{arctg}^3(2x+1)}{\operatorname{ch}\sqrt{x}}.$

9.15. $y = \dfrac{\arccos 4x^3}{\operatorname{sh}^4 x}.$

9.16. $y = \dfrac{\operatorname{cth}^2(x-2)}{\arccos 3x}.$

9.17. $y = \dfrac{\operatorname{th}^3(2x+2)}{\arcsin 5x}.$

9.18. $y = \dfrac{\operatorname{cth}^2(3x-1)}{\arccos x^2}.$

9.19. $y = \dfrac{\operatorname{sh}^5 x}{\arccos 4x}.$

9.20. $y = \dfrac{\sqrt{\operatorname{ch}^3 x}}{\operatorname{arctg} 5x}.$

9.21. $y = \dfrac{\operatorname{th}^2(x+3)}{\operatorname{arcctg}\sqrt{x}}.$

9.22. $y = \dfrac{\arcsin^2 3x}{\operatorname{ch}(x-5)}.$

9.23. $y = \dfrac{\operatorname{arcctg}^3 x}{\operatorname{sh}(2x-5)}.$

9.24. $y = \dfrac{\arccos^3 5x}{\operatorname{th}(x-2)}.$

9.25. $y = \dfrac{\sqrt{\arccos 3x}}{\operatorname{sh}^2 x}.$

9.26. $y = \dfrac{\arcsin^2 3x}{\sqrt{\operatorname{th} x}}.$

9.27. $y = \dfrac{\operatorname{arctg}^2 5x}{\sqrt[3]{\operatorname{cth} x}}.$

9.28. $y = \dfrac{\operatorname{arctg}^2 5x}{\operatorname{th}(x+3)}.$

9.29. $y = \dfrac{\sqrt{\operatorname{sh}^3 x}}{\operatorname{arcctg} 5x}.$

9.30. $y = \dfrac{\sqrt[5]{\operatorname{ch} 3x}}{\operatorname{arctg}(x+2)}.$

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10.

10.1. $y = \dfrac{9\arctg(x+7)}{(x-1)^2}.$

10.2. $y = \dfrac{8\arctg(2x+3)}{(x+1)^3}.$

10.3. $y = \dfrac{7\arccos(4x-1)}{(x+2)^4}.$

10.4. $y = \dfrac{9\arcsin(x+5)}{(x-2)^5}.$

10.5. $y = \dfrac{3\arcctg(2x-5)}{(x+1)^4}.$

10.6. $y = \dfrac{2\arctg(3x+2)}{(x-3)^2}.$

10.7. $y = \dfrac{4\arccos 3x}{(x+2)^5}.$

10.8. $y = \dfrac{\arcsin(3x+8)}{(x-7)^3}.$

10.9. $y = \dfrac{7\arctg(4x+1)}{(x-4)^2}.$

10.10. $y = \dfrac{3\arcsin(2x-7)}{(x+2)^4}.$

10.11. $y = \dfrac{2\lg(4x+5)}{(x+6)^4}.$

10.12. $y = \dfrac{5\ln(5x+7)}{(x-7)^2}.$

10.13. $y = \dfrac{4\log_3(3x+1)}{(x+1)^2}.$

10.14. $y = \dfrac{7\log_4(2x-5)}{(x-1)^5}.$

10.15. $y = \dfrac{\ln(7x+2)}{(x-6)^4}.$

10.16. $y = \dfrac{4\lg(3x+7)}{(x+1)^7}.$

10.17. $y = \dfrac{5\log_2(x^2+1)}{(x-3)^4}.$

10.18. $y = \dfrac{6\log_3(2x+9)}{(x+4)^2}.$

10.19. $y = \dfrac{3\log_2(5x-4)}{(x-3)^5}.$

10.20. $y = \dfrac{7\log_5(x^2+x)}{(x+3)^3}.$

10.21. $y = \dfrac{\log_7(2x^2+5)}{(x-4)^2}.$

10.22. $y = \dfrac{2\ln(3x-10)}{(x+5)^7}.$

10.23. $y = \dfrac{8\lg(4x+5)}{(x-1)^5}.$

10.24. $y = \dfrac{2\log_3(4x-7)}{(x+3)^4}.$

10.25. $y = \dfrac{3\log_4(2x+9)}{(x-7)^2}$.

10.26. $y = \dfrac{\lg(x^2+2x)}{(x+8)^4}$.

10.27. $y = \dfrac{3\ln(x^2+5)}{(x-7)^3}$.

10.28. $y = \dfrac{4\log_2(3x-5)}{(x-2)^2}$.

10.29. $y = \dfrac{2\ln(2x^2+3)}{(x-7)^4}$.

10.30. $y = \dfrac{4\lg(3x+7)}{(x-5)^3}$.

11.

11.1. $y = \sqrt{\dfrac{2x+1}{2x-1}}\,\log_2(x-3x^2)$.

11.2. $y = \sqrt[3]{\dfrac{2x-5}{2x+3}}\,\lg(4x+7)$.

11.3. $y = \sqrt[4]{\dfrac{x+3}{x-3}}\,\ln(5x^2-2x+1)$.

11.4. $y = \sqrt[5]{\dfrac{x+1}{x-1}}\,\log_3(x^2+x+4)$.

11.5. $y = \sqrt[6]{\dfrac{7x-4}{7x+4}}\,\log_5(3x^2+2x)$.

11.6. $y = \sqrt[7]{\dfrac{2x-3}{2x+1}}\,\lg(7x-10)$.

11.7. $y = \sqrt[8]{\dfrac{5x+1}{5x-1}}\,\ln(3x-x^2)$.

11.8. $y = \sqrt[9]{\dfrac{x+3}{x-3}}\,\log_5(2x-3)$.

11.9. $y = \sqrt{\dfrac{6x+5}{6x-5}}\,\lg(4x+7)$.

11.10. $y = \sqrt[3]{\dfrac{4x-1}{4x+1}}\,\ln(2x^3-3)$.

11.11. $y = \sqrt[4]{\dfrac{x+6}{x-6}}\,\sin(3x^2+1)$.

11.12. $y = \sqrt[5]{\dfrac{x-7}{x+7}}\,\cos(2x^3+x)$.

11.13. $y = \sqrt[6]{\dfrac{x-9}{x+9}}\,\operatorname{tg}(3x^2-4x+1)$.

11.14. $y = \sqrt[7]{\dfrac{x-4}{x+4}}\,\operatorname{ctg}(2x+5)$.

11.15. $y = \sqrt[8]{\dfrac{x-2}{x+2}}\,\sin(4x^2-7x+2)$.

11.16. $y = \sqrt[9]{\dfrac{x-3}{x+3}}\,\cos(x^2-3x+2)$.

11.17. $y = \sqrt{\dfrac{3x-2}{3x+2}}\,\operatorname{tg}(2x^2-9)$.

11.18. $y = \sqrt{\dfrac{2x+3}{2x-3}}\,\operatorname{ctg}(3x^2+5)$.

11.19. $y = \sqrt[4]{\dfrac{x+5}{x-5}} \sin(3x^2 - x + 4).$ **11.20.** $y = \sqrt[5]{\dfrac{x-6}{x+6}} \cos(7x+2).$

11.21. $y = \sqrt[6]{\dfrac{x-7}{x+7}} \arcsin(2x+3).$ **11.22.** $y = \sqrt[7]{\dfrac{x-8}{x+8}} \arccos(3x-5).$

11.23. $y = \sqrt[8]{\dfrac{x-4}{x+4}} \operatorname{arctg}(5x+1).$ **11.24.** $y = \sqrt[9]{\dfrac{x-1}{x+1}} \operatorname{arcctg}(7x+2).$

11.25. $y = \sqrt{\dfrac{7x-4}{7x+4}} \arcsin(x^2+1).$ **11.26.** $y = \sqrt[3]{\dfrac{8x-3}{8x+3}} \arccos(x^2-5).$

11.27. $y = \sqrt[4]{\dfrac{2x-5}{2x+5}} \operatorname{arctg}(3x+2).$ **11.28.** $y = \sqrt[5]{\dfrac{3x-4}{3x+4}} \operatorname{arcctg}(2x+5).$

11.29. $y = \sqrt[6]{\dfrac{x^2-1}{x^2+1}} \arcsin(2x).$ **11.30.** $y = \sqrt[7]{\dfrac{x^2+3}{x^2-3}} \arccos(4x).$

12.

12.1. $y = (\operatorname{cth}3x)^{\arcsin x}.$ **12.2.** $y = (\cos(x+2))^{\ln x}.$

12.3. $y = (\sin 3x)^{\arccos x}.$ **12.4.** $y = (th5x)^{\arcsin(x+1)}.$

12.5. $y = (sh(x+2))^{\arcsin 2x}.$ **12.6.** $y = (\cos 5x)^{\operatorname{arctg}\sqrt{x}}.$

12.7. $y = (\sqrt{3x+2})^{\operatorname{arcctg}3x}.$ **12.8.** $y = (\ln(x+3))^{\sin\sqrt{x}}.$

12.9. $y = (\log_2(x+4))^{\operatorname{ctg}7x}.$ **12.10.** $y = (sh\,3x)^{\operatorname{arctg}(x+2)}.$

12.11. $y = (\operatorname{ch}3x)^{\operatorname{ctg}(1/x)}.$ **12.12.** $y = (\arcsin 5x)^{\operatorname{tg}\sqrt{x}}.$

12.13. $y = (\arccos 5x)^{\ln x}.$ **12.14.** $y = (\operatorname{arctg}2x)^{\sin x}.$

12.15. $y = (\ln(x+7))^{\operatorname{ctg}2x}.$ **12.16.** $y = (\operatorname{ctg}(7x+4))^{\sqrt{x+3}}.$

12.17. $y = (\operatorname{th}\sqrt{x+1})^{\operatorname{arctg}2x}.$ **12.18.** $y = (\operatorname{cth}(1/x))^{\arcsin 7x}.$

12.19. $y = (\cos(x+5))^{\arcsin 3x}.$ **12.20.** $y = (\sqrt{x+5})^{\arccos 3x}.$

12.21. $y = (\sin 4x)^{\operatorname{arctg}(1/x)}.$ **12.22.** $y = (\operatorname{tg}3x^4)^{\sqrt{x+3}}.$

12.23. $y = (\operatorname{ctg} 2x^3)^{\sin\sqrt{x}}$.

12.24. $y = (\operatorname{tg} 7x^5)^{\sqrt{x+2}}$.

12.25. $y = (\arccos x)^{\sqrt{\cos x}}$.

12.26. $y = (\operatorname{ctg} 7x)^{sh(x+3)}$.

12.27. $y = (\operatorname{sh} 5x)^{\operatorname{arctg}(x+2)}$.

12.28. $y = (\operatorname{arctg} x)^{th(3x+1)}$.

12.29. $y = (\operatorname{cth}\sqrt{x})^{\sin(x+3)}$.

12.30. $y = (\operatorname{sh} 3x)^{\operatorname{arcctg} 2x}$.

13.

13.1. $y = (\arccos(x+2))^{\operatorname{tg} 3x}$.

13.2. $y = (\arcsin 2x)^{\operatorname{ctg}(x+1)}$.

13.3. $y = (\operatorname{arctg}(x+7))^{\cos 2x}$.

13.4. $y = (\operatorname{arcctg}(3x-3))^{\sin 4x}$.

13.5. $y = (\operatorname{ctg}(3x-2))^{\arcsin 3x}$.

13.6. $y = (\operatorname{tg}(4x-3))^{\arccos 2x}$.

13.7. $y = (\cos(2x-5))^{\operatorname{arctg} 5x}$.

13.8. $y = (\sin(7x+4))^{\operatorname{arcctg} x}$.

13.9. $y = (\arcsin 2x)^{\ln(x+3)}$.

13.10. $y = (\arccos 3x)^{\lg(5x-1)}$.

13.11. $y = (\operatorname{arctg} 5x)^{\log_2(x+4)}$.

13.12. $y = (\operatorname{arctg} 7x)^{\lg(x+1)}$.

13.13. $y = (\log_4(2x+3))^{\arcsin x}$.

13.14. $y = (\log_5(3x+2))^{\arccos x}$.

13.15. $y = (\lg(7x-5))^{\operatorname{arctg} 2x}$.

13.16. $y = (\ln(5x-4))^{\operatorname{arcctg} x}$.

13.17. $y = (\log_2(6x+5))^{\arcsin 2x}$.

13.18. $y = (\lg(4x-3))^{\arccos x}$.

13.19. $y = (\ln(7x-3))^{\operatorname{arctg} 5x}$.

13.20. $y = (\log_5(2x+5))^{\operatorname{arctg} x}$.

13.21. $y = (\sin(8x-7))^{\operatorname{cth}(x+3)}$.

13.22. $y = (\cos(3x+8))^{th(x-7)}$.

13.23. $y = (\operatorname{tg}(9x+2))^{ch(2x-1)}$.

13.24. $y = (\operatorname{ctg}(7x+5))^{sh 3x}$.

13.25. $y = (\operatorname{ch}(3x-7))^{\cos(x+4)}$.

13.26. $y = (\operatorname{ch}(2x-3))^{\operatorname{tg}(x+5)}$.

13.27. $y = (\operatorname{th}(7x-5))^{\sin(x+2)}$.

13.28. $y = (\operatorname{ch}(3x+2))^{\cos(x+4)}$.

13.29. $y = (\ln(7x+4))^{\operatorname{tg} x}$.

13.30. $y = (\lg(8x+3))^{\operatorname{tg} 5x}$.

14.

14.1. $y = \dfrac{\sqrt{x+7}(x-3)^4}{(x+2)^5}$.

14.2. $y = \dfrac{(x-3)^5(x+2)^3}{\sqrt{(x-1)^3}}$.

14.3. $y = \dfrac{(x-2)^3\sqrt{(x+1)^5}}{(x-4)^2}$.

14.4. $y = \dfrac{(x+3)\sqrt[5]{(x-2)^2}}{(x+1)^7}$.

14.5. $y = \dfrac{(x+2)^7(x-3)^3}{\sqrt{(x+1)^3}}$.

14.6. $y = \dfrac{(x-1)^4(x+2)^5}{\sqrt[3]{(x-4)^2}}$.

14.7. $y = \dfrac{(x-3)^2\sqrt{x+4}}{(x+2)^7}$.

14.8. $y = \dfrac{(x-7)^{10}\sqrt{3x-1}}{(x+3)^5}$.

14.9. $y = \dfrac{(x+1)^8(x-3)^2}{\sqrt{(x+2)^5}}$.

14.10. $y = \dfrac{(x+2)(x-7)^4}{\sqrt[3]{(x-1)^4}}$.

14.11. $y = \dfrac{\sqrt[5]{(x+4)^3}}{(x-1)^2(x+3)^5}$.

14.12. $y = \dfrac{\sqrt[3]{(x-1)^7}}{(x+1)^5(x-5)^3}$.

14.13. $y = \dfrac{\sqrt{(x+2)^3}(x-1)^4}{(x+2)^7}$.

14.14. $y = \dfrac{\sqrt[3]{(x-2)^5}(x+3)^2}{(x-7)^3}$.

14.15. $y = \dfrac{\sqrt[4]{x-8}(x+2)^6}{(x-1)^5}$.

14.16. $y = \dfrac{\sqrt[5]{x+1}(x-3)^7}{(x+8)^3}$.

14.17. $y = \dfrac{\sqrt[7]{(x-2)^4}}{(x+1)^2(x-6)^5}$.

14.18. $y = \dfrac{\sqrt[5]{(x+1)^2}}{(x-3)^4(x-4)^3}$.

14.19. $y = \dfrac{\sqrt{x^2+2x-3}}{(x+3)^7(x-4)^2}$.

14.20. $y = \dfrac{\sqrt[3]{(x-2)^4}}{(x-5)(x+1)^7}$.

14.21. $y = \dfrac{(x+4)^3(x-2)^4}{\sqrt[3]{(x-2)^5}}.$

14.22. $y = \dfrac{(x-1)^6(x+2)^3}{\sqrt[3]{(x+3)^2}}.$

14.23. $y = \dfrac{(x-1)^4(x-7)^2}{\sqrt[3]{(x+2)^5}}.$

14.24. $y = \dfrac{(x+7)^2(x-3)^5}{\sqrt{x^2+3x-1}}.$

14.25. $y = \dfrac{\sqrt[3]{x-3}\,(x+7)^5}{(x-4)^2}.$

14.26. $y = \dfrac{\sqrt{x+10}\,(x-8)^3}{(x-1)^5}.$

14.27. $y = \dfrac{\sqrt[5]{(x-2)^3}\,(x-1)}{(x+3)^4}.$

14.28. $y = \dfrac{\sqrt[4]{(x+1)^3}\,(x-2)^5}{(x-3)^2}.$

14.29. $y = \dfrac{\sqrt[6]{(x-1)^5}}{(x+2)^4(x-5)^7}.$

14.30. $y = \dfrac{\sqrt[5]{(x+2)^3}}{(x-1)^4(x-3)^5}.$

5.1-YT шығару үлгісі (5.1.4.-5.1.6. пп)

Берілген функцияларды дифференциалдау керек:

1. $y = 9x^5 - \dfrac{4}{x^3} + \sqrt[3]{x^7} - 3x + 4.$

► $y' = \left(9x^5 - \dfrac{4}{x^3} + \sqrt[3]{x^7} - 3x + 4\right)' =$

$= 9\cdot 5x^4 - 4\,(-3)\,x^{-4} + \dfrac{7}{3}x^{\frac{4}{3}} - 3 = 45x^4 + \dfrac{12}{x^4} + \dfrac{7}{3}\sqrt[3]{x^4} - 3.$ ◄

2. $y = \sqrt[4]{\left(2x^2 - 3x + 1\right)^3} - \dfrac{6}{\left(x+1\right)^3}.$