

22. Исследовать функцию на экстремум.

1.  $y = \frac{x}{\sqrt[3]{x^2 - 4}}$ .
2.  $y = \frac{\ln x}{x}$ .
3.  $y = \frac{\ln^2 x}{x}$ .
4.  $y = (x-1)e^{3x}$ .
5.  $y = x^2 \ln x$ .
6.  $y = x^3 e^{-4x}$ .
7.  $y = (3-x^2)e^x$ .
8.  $y = (x^2 - 8)e^{-x}$ .
9.  $y = x \ln x$ .
10.  $y = \frac{x}{x^2 + 4}$ .
11.  $y = 16x^2(x-1)^2$ .
12.  $y = \sqrt{4x - x^2}$ .
13.  $y = \sqrt{x} \ln x$ .
14.  $y = \sqrt[3]{(1-x)(x-2)^2}$ .
15.  $y = \frac{1}{x^2 - x}$ .
16.  $y = \frac{(x-1)^2}{x+1}$ .
17.  $y = x + \sqrt{3-x}$ .
18.  $y = (x+1)^5 e^{-x}$ .
19.  $y = x e^{-2x^2}$ .
20.  $y = \sqrt[3]{(x-2)^2(x-4)^2}$ .
21.  $y = \sqrt[3]{x^3 - 2x^2 + x}$ .
22.  $y = x \cdot \sqrt[3]{x-1}$ .
23.  $y = \sqrt[3]{x^2} - x$ .
24.  $y = \sqrt[3]{2x^2 - x^3}$ .
25.  $y = 3 \cdot \sqrt[3]{x^2(x-1)}$ .
26.  $y = (x-2)^5(2x+1)^4$ .
27.  $y = \frac{(x+3)^2}{(x+1)^2}$ .
28.  $y = x^3 \ln x$ .
29.  $y = \frac{x^4}{(x+1)^3}$ .
30.  $y = (x+2)^2(x-3)^3$ .

23. Найти наибольшее и наименьшее значения функции на указанном отрезке.

1.  $y = \frac{x^3}{x^2 - 2x - 1}$ ,  $[4; 6]$ .
2.  $y = \frac{2x^3}{x^2 - 9}$ ,  $[4; 6]$ .
3.  $y = x^2 + \frac{16}{x} - 16$ ,  $[1; 4]$ .
4.  $y = \sqrt[3]{2(x-2)^2(8-x)} - 1$ ,  $[0; 6]$ .
5.  $y = \frac{10x}{x^2 + 1}$ ,  $[0; 3]$ .
6.  $y = \frac{2(x^2 + 3)}{x^2 - 2x + 5}$ ,  $[-3; 3]$ .
7.  $y = \frac{x^2}{x^2 - 2x + 3}$ ,  $[-1; 3]$ .
8.  $y = 2\sqrt{x} - x$ ,  $[0; 4]$ .
9.  $y = x + 3 \cdot \sqrt[3]{x}$ ,  $[-10; 1]$ .
10.  $y = x - 4\sqrt{x} + 5$ ,  $[1; 9]$ .
11.  $y = 2x^2 + \frac{108}{x} - 59$ ,  $[2; 4]$ .
12.  $y = x^3 \cdot \sqrt[3]{(x-1)^2}$ ,  $[-2; 2]$ .
13.  $y = 4 - x - \frac{4}{x^2}$ ,  $[1; 4]$ .
14.  $y = (x+1) \cdot \sqrt[3]{x^2}$ ,  $[-1; 3]$ .
15.  $y = x^2 \cdot \sqrt[3]{(x+1)^2}$ ,  $[-2; 1]$ .
16.  $y = x - \ln(1+x)$ ,  $[-0,5; 2]$ .
17.  $y = x \ln x$ ,  $\left[\frac{1}{e^2}; 1\right]$ .
18.  $y = e^{2x-x^2}$ ,  $[-2; 2]$ .

$$19. y = \frac{e^{-x}}{x}, \quad [1; 3].$$

$$21. y = \frac{1-x+x^2}{1+x-x^2}, \quad [0; 1].$$

$$23. y = x \ln \frac{x}{5}, \quad [1; 5].$$

$$25. y = \frac{x^3+2x^2}{x-2}, \quad [-1; 1].$$

$$27. y = \frac{x^4+1}{x^2+1}, \quad [-1; 1].$$

$$29. y = 2\sqrt{x-1} - x + 2, \quad [1; 5].$$

$$20. y = (3-x)e^{-x}, \quad [0; 5].$$

$$22. y = \sqrt[3]{2(x+2)^2(1-x)}, \quad [-3; 4].$$

$$24. y = x^3 e^{-x}, \quad [-1; 4].$$

$$26. y = \frac{\ln x}{x}, \quad [1; 4].$$

$$28. y = \sqrt[3]{2x^2(x-3)}, \quad [-1; 6].$$

$$30. y = \frac{x-1}{x+1}, \quad [0; 4].$$

25. Найти промежутки выпуклости вверх, промежутки выпуклости вниз и точки перегиба функции  $f(x)$ .

1.  $f(x) = \frac{1}{12}x^4 - 2x^2 + 15x - 7.$

2.  $f(x) = \frac{1}{12}x^4 + \frac{5}{6}x^3 + 3x^2 - 26 + 7x.$

3.  $f(x) = x^4 - 6x^2 + 23x - 5.$

4.  $f(x) = \frac{1}{12}x^4 + \frac{1}{6}x^3 - 3x^2.$

5.  $f(x) = 2x^4 - 44x^3 - 41x + 3.$

6.  $f(x) = -\frac{1}{6}x^4 + \frac{4}{3}x^3 - 4x^2 + 6x - 8.$



7.  $f(x) = -\frac{1}{6}x^4 + \frac{1}{3}x^3 - 3x^2 - 15x + 23.$
8.  $f(x) = -\frac{1}{6}x^4 - \frac{1}{6}x^3 + \frac{1}{2}x^2 + 2x - 2.$
9.  $f(x) = x^4 - 10x^3 + 24x^2 - 6x + 7.$
10.  $f(x) = -x^4 - 20x^3 - 150x^2 - 5x - 64.$
11.  $f(x) = -2x^4 + 8x^3 + 36x^2 - 3x + 9.$
12.  $f(x) = x^4 - 16x^3 + 96x^2 - 56x + 25.$
13.  $f(x) = -0,5x^4 - 3x^3 + 12x^2 + 2x - 1.$
14.  $f(x) = x^4 - 16x^3 + 96x^2 + 10x + 10.$
15.  $f(x) = -0,5x^4 - 2x^3 + 24x^2 + x + 3.$
16.  $f(x) = -x^4 - 6x^3 + 2x + 3.$
17.  $f(x) = (4/3)x^3 - 8x^2 + 16x + 12.$
18.  $f(x) = x^4 + 10x^3 + 10x + 9.$
19.  $f(x) = -2x^4 - 8x^3 - 12x^2 + x + 12.$
20.  $f(x) = -2x^4 - 8x^3 - 48x^2 - x + 4.$
21.  $f(x) = x^4 - 8x^3 + 24x^2 - 3x + 45.$
22.  $f(x) = -x^4 + 2x^3 + 12x^2 + 5.$
23.  $f(x) = 2x^3 + 6x^2 + 6x + 21.$
24.  $f(x) = -2x^4 - 4x^3 - 10x + 8.$
25.  $f(x) = x^4 - 4x^3 + 6x^2 + 10x + 12.$
26.  $f(x) = 2x^4 - 20x^3 + 2x + 10.$
27.  $f(x) = -0,5x^4 + 2x^3 + 2x + 3.$
28.  $f(x) = 0,5x^4 - 4x^3 - 3x + 7.$
29.  $f(x) = -x^4 + 6x^3 - 12x^2 - x.$
30.  $f(x) = 0,5x^4 + x^3 + 6x^2 - x + 43.$

26. Провести полное исследование и построить график функции.

1.  $y = \frac{x^2 - 8}{(x-2)^2}.$
2.  $y = \frac{2x-1}{x^2}.$
3.  $y = \frac{18x-3x^2}{(x-3)^2}.$
4.  $y = \frac{4x-8}{(x-1)^2}.$
5.  $y = \frac{3x^2-6x}{x-1}.$
6.  $y = \frac{2x^2-1}{x^4}.$
7.  $y = \frac{8(x-1)}{(x+1)^2}.$
8.  $y = \frac{3x-2}{x^3}.$
9.  $y = -\frac{x}{(x-2)^4}.$
10.  $y = \frac{x^2-1}{x^3}.$
11.  $y = \frac{2x-1}{(x-1)^2}.$
12.  $y = \frac{(x+1)^3}{(x-1)^2}.$
13.  $y = \frac{1-3x^2}{x^3}.$
14.  $y = -\frac{x^2}{(x+1)^2}.$
15.  $y = \frac{(x+2)^2}{(x-2)^2}.$
16.  $y = \frac{x^3}{(x-1)^2}.$
17.  $y = \frac{x^4}{x^3-1}.$
18.  $y = \frac{x^2+8}{(x+2)^2}.$
19.  $y = \frac{3x^4+1}{x^3}.$
20.  $y = \frac{(x+1)^2}{x-2}.$
21.  $y = \frac{x^3+4}{x^2}.$
22.  $y = \frac{x^3}{x^2-3}.$
23.  $y = \frac{x^2-2x+2}{x-1}.$
24.  $y = \frac{2x^3}{x^2-1}.$
25.  $y = \frac{x^3}{x^2+3}.$
26.  $y = \frac{1}{x^4-1}.$
27.  $y = \frac{x^3}{4-x^2}.$
28.  $y = \frac{3-2x}{(x-2)^2}.$
29.  $y = \frac{(x+2)^2}{x^3}.$
30.  $y = -\frac{x^2}{(x-3)^3}.$

27. Провести полное исследование и построить график функции.

1.  $y = \frac{1}{x \ln x}.$
2.  $y = xe^{1/(1-x)}.$
3.  $y = \frac{x^2}{\ln x}.$
4.  $y = \frac{\ln^2 x}{x^2}.$
5.  $y = (x-1)e^{3x+1}.$
6.  $y = (1+x^2)e^x.$

7.  $y = x^3 e^x.$

10.  $y = e^{x^2-6x}.$

13.  $y = \frac{x}{\ln x}.$

16.  $y = \frac{\ln x}{x^2}.$

19.  $y = x e^{-x}.$

22.  $y = \frac{\ln x}{\sqrt{x}}.$

25.  $y = \frac{e^{2-x}}{2-x}.$

28.  $y = x \ln x.$

8.  $y = (x+4)e^{-(3+x)}.$

11.  $y = x e^{-x^2/2}.$

14.  $y = \frac{e^{x+3}}{x+3}.$

17.  $y = x^2 e^{-x}.$

20.  $y = \frac{\ln^2 x}{x}.$

23.  $y = (2+x^2)e^{-x^2}.$

26.  $y = x e^{1/(2-x)}.$

29.  $y = \frac{\ln x}{x}.$

9.  $y = e^{\frac{1}{x-1}}.$

12.  $y = (x+2)e^{1/x}.$

15.  $y = (x-1)e^{x-1}.$

18.  $y = \frac{x}{\ln^3 x}.$

21.  $y = e^{-1/x^2}.$

24.  $y = x e^{-2x^2}.$

27.  $y = x^3 e^{-x}.$

30.  $y = x^2 \ln x.$