

## ЗАДАЧИ К БЛОКУ 2 ПЕРВОГО СЕМЕСТРА ПЕРВОГО КУРСА

Провести полное исследование и  
построить график функции:

1.

$$y = x^3 - 3x$$

2.

$$y = \frac{x^3}{3} - x^2 - 3x$$

3.

$$y = x^3 + 6x^2 + 9x$$

4.

$$y = \frac{x^3}{3} + x^2$$

5.

$$y = 1 + 2x^2 - \frac{x^4}{4}$$

6.

$$y = \frac{x^4}{4} + x^3$$

7.

$$y = \frac{x^4}{4} - \frac{x^3}{3}$$

8.

$$y = \frac{x^4}{4} - 2x^2$$

9.

$$y = 3x^5 - 5x^3$$

10.

$$y = \frac{x^5}{5} - x^4 + x^3$$

11.

$$y = (x^2 - 1)^3$$

12.

$$y = 32x^2(x^2 - 1)^3$$

13.

$$y = x + 2\sqrt{-x}$$

14.

$$y = x\sqrt{1-x}$$

15.

$$y = \frac{6\sqrt{x}}{x+2}$$

16.

$$y = \sqrt{x^2 + 1} + \sqrt{x^2 - 1}$$

17.

$$y = \sqrt{x^2 - 1} - \sqrt{x^2 + 1}$$

18.

$$y = \sqrt[3]{x^2} - 1$$

19.

$$y = 1 - \sqrt[3]{(x - 4)^2}$$

20.

$$y = 2x - 3\sqrt[3]{x^2}$$

21.

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

22.

$$y = (x - 2)^{\frac{2}{3}} - (x + 2)^{\frac{2}{3}}$$

23.

$$y = (x - 2)^{\frac{2}{3}} + (x + 2)^{\frac{2}{3}}$$

24.

$$y = x^{\frac{2}{3}}(1 - x)$$

25.

$$y = x(x - 1)^{\frac{2}{3}}$$

26.

$$y = \frac{x}{1 - x^2}$$

27.

$$y = \frac{x}{x^2 - 4}$$

28.

$$y = \frac{x}{x^2 + 1}$$

29.

$$y = \frac{2x - 1}{(x - 1)^2}$$

30.

$$y = \frac{3 - 2x}{(x - 2)^2}$$

31.

$$y = \frac{x - 1}{(x - 2)(x - 5)}$$

32.

$$y = \frac{x}{(x - 1)(4 - x)}$$

33.

$$y = \frac{x^2}{x^2 - 1}$$

34.

$$y = \frac{(x + 1)^2}{x^2 + 2x}$$

35.

$$y = \frac{(x - 1)^2}{x^2 + 1}$$

36.

$$y = \frac{(x - 3)^2}{x^2 - 4x + 5}$$

37.

$$y = \frac{x^2 - x + 1}{3x - x^2 - 3}$$

38.

$$y = xe^{-\frac{x}{2}}$$

39.

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

40.

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

41.

$$y = (x + 4)^2e^{-\frac{x}{2}}$$

42.

$$y = xe^{-\frac{x^2}{2}}$$

43.

$$y = xe^{\frac{3-x^2}{2}}$$

44.

$$y = (1 - x)e^x$$

45.

$$y = (x - 2)^2e^x$$

46.

$$y = x^3e^x$$

47.

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

48.

$$y = \frac{e^x}{x}$$

49.

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

50.

$$y = \frac{e^x}{4(1 - x)}$$

51.

$$y = \frac{e^x}{(1 - x)^2}$$

52.

$$y = \frac{e^{-x}}{x^2 - 3}$$

53.

$$y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$$

54.

$$y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

55.

$$y = \frac{2}{e^x(x + 3)}$$

56.

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

57.

$$y = x \ln x$$

58.

$$y = x - \ln x$$

59.

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

60.

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

61.

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

62.

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

63.

$$y = \frac{1 + \ln x}{x}$$

64.

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

65.

$$y = \frac{x}{\ln |x|}$$

66.

$$y = -\frac{\ln x}{x^2}$$

67.

$$y = \frac{\ln(x-1)}{(x-1)^2}$$

68.

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

69.

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

70.

$$y = x^{\frac{2}{3}}e^{-x}$$

71.

$$y = \frac{x}{2} + \frac{2}{x}$$

72.

$$y = 2x + \frac{1}{x^2}$$

73.

$$y = \frac{x^3}{1-x^2}$$

74.

$$y = \frac{x^3}{1+x^2}$$



75.

$$y = \frac{x^3}{(x-1)^2}$$

76.

$$y = \frac{(x-2)^2}{2(x-1)}$$

77.

$$y = x + \operatorname{arctg} x$$

78.

$$y = \frac{(x+1)^3}{(x-1)^2}$$

79.

$$y = \frac{x^4}{(1+x)^3}$$

80.

$$y = \frac{x}{2} + \operatorname{arcctg} x$$

81.

$$y = x - \operatorname{arctg} 2x$$

82.

$$y = x - 2\operatorname{arctg} x$$

83.

$$y = (x+2)e^{\frac{1}{x}}$$

84.

$$y = 1 + xe^{\frac{2}{x}}$$

85.

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

86.

$$y = \sqrt[3]{x^2(1-x)}$$

87.

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

88.

$$y = \sqrt[3]{x(3-x)^2}$$

89.

$$y = x - 2\operatorname{tg} x$$

90.

$$y = x + \sin 2x$$

91.

$$y = \sqrt[3]{x(2-x^2)}$$

92.

$$y = x^3 - 3x$$

93.

$$y = \frac{x^3}{3} - x^2 - 3x$$

94.

$$y = x^3 + 6x^2 + 9x$$

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111.

$$y = 2x - 3\sqrt[3]{x^2}$$

112.

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

113.

$$y = (x-2)^{\frac{2}{3}} - (x+2)^{\frac{2}{3}}$$

114.

$$y = (x - 2)^{\frac{2}{3}} + (x + 2)^{\frac{2}{3}}$$

115.

$$y = x^{\frac{2}{3}}(1 - x)$$

116.

$$y = x(x - 1)^{\frac{2}{3}}$$

117.

$$y = \frac{x}{1 - x^2}$$

118.

$$y = \frac{x}{x^2 - 4}$$

119.

$$y = \frac{x}{x^2 + 1}$$

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$$y = \frac{2x - 1}{(x - 1)^2}$$

121.

$$y = \frac{3 - 2x}{(x - 2)^2}$$

122.

$$y = \frac{x - 1}{(x - 2)(x - 5)}$$

123.

$$y = \frac{x}{(x - 1)(4 - x)}$$

124.

$$y = \frac{x^2}{x^2 - 1}$$

125.

$$y = \frac{(x + 1)^2}{x^2 + 2x}$$

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127.

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$$y = (x + 4)^2e^{-\frac{x}{2}}$$

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$$y = x^3 e^x$$

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

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$$y = \frac{e^x}{x}$$

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

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$$y = \frac{e^x}{4(1 - x)}$$

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$$y = \frac{e^x}{(1 - x)^2}$$

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$$y = \frac{e^{-x}}{x^2 - 3}$$

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$$y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$$

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$$y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$$

146.

$$y = \frac{2}{e^x(x+3)}$$

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148.

$$y = x \ln x$$

149.

$$y = x - \ln x$$

150.

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

151.

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

152.

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

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



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

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$$y = \frac{x}{\ln |x|}$$

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$$y = x^{\frac{2}{3}}e^{-x}$$

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$$y = x - 2\operatorname{tg} x$$

181.

$$y = x + \sin 2x$$

182.

$$y = \sqrt[3]{x(2-x^2)}$$