

Обыкновенные дифференциальные уравнения. ДЗ № 1

Задача 7. Решить дифференциальное уравнение

1. $y'\sqrt{x} = \sqrt{y-x} + \sqrt{x}$
2. $y'^2 - yy' + e^x = 0$
3. $(x^2y^2 + 1)y + (xy - 1)^2xy' = 0$
4. $y \sin x + y' \cos x = 1$
5. $y'^3 + (y'^2 - 2y')x = 3y' - y$
6. $2xdy + ydx + xy^2(xdy + ydx) = 0$
7. $y' = \left(\frac{3x+y^3-1}{y}\right)^2$
8. $6x^5ydx + (y^4 \ln y - 3x^6)dy = 0$
9. $xdy - ydx = x\sqrt{x^2 + y^2}dx$
10. $(2xe^y + y^4)y' = ye^y$
11. $(2x^2y - 3y^2)y' = 6x^2 - 2xy^2 + 1$
12. $(xy' - y)^3 = y'^3 - 1$
13. $y' = \frac{(1+y)^2}{x(y+1)-x^2}$
14. $(xy' - y)^2 = x^2y^2 - x^4$
15. $(x + y)(1 - xy)dx + (x + 2y)dy = 0$
16. $y' = \operatorname{tg}(y - 2x)$
17. $(2x - \ln(y + 1))dx - \frac{x+y}{y+1}dy = 0$
18. $\left(x - y \cos \frac{y}{x}\right)dx + x \cos \frac{y}{x}dy = 0$
19. $\frac{xy'}{y} + 2xy \ln x + 1 = 0$
20. $x(y'^2 + e^{2x}) = -2y'$
21. $ydx - xdy = y\sqrt{x^2 + y^2}dx$
22. $(2xe^y - y^4)y' = ye^y$
23. $xy' - y = \sqrt{x^2y^2 - x^4}$
24. $(xy' - y)^3 = y'^3 + 1$
25. $(x - y)(1 + xy)dx + (2y - x)dy = 0$
26. $(y^4 - 2xe^y)y' + ye^y = 0$
27. $(xy' - y)^2 = x^2y^2 - 4x^4$
28. $xy' + y = 2xy^2 \ln x$

Задача 8. Решить дифференциальное уравнение

1. $y'' (3 + yy'^2) = y'^4$
2. $y'^2 + 2yy'' = y$
3. $yy'' = y'^2 - y^3 y'$
4. $y'' = y^2(y' - 1)^2$
5. $y'^2 - 2yy'' = y'$
6. $y(2y'' + y') = y'^2 + 1$
7. $yy'' = y'^2 + y^2 y'$
8. $yy'' = y'^2 + 2y^2$
9. $y'' y^2 = 1$
10. $y'^2 + 3xyy'' = 0$
11. $y'' (2 - yy'^2) = y'^4$
12. $y'^2 - 2yy'' = 3y$
13. $yy'' = 2y'^2 - 3y^2$
14. $2y'^2 - yy'' = 3y$
15. $yy'' = 2y'^2 - y^4 y'$
16. $y'' = y'^2(y + 2)^2$
17. $y'' (2 - yy'^2) = 3y'^4$
18. $y'^2 - 4xyy'' = 0$
19. $yy'' = 3y^2 - y'^2$
20. $y'^2 - 2y'y'' = 3y$
21. $y'' (2 - yy'^2) = y'^4$
22. $y(2y'' - y') = y'^2 + 1$
23. $yy'' = 2y'^2 + y^4 y'$
24. $yy'' = y'^2 + y^3 y'$
25. $y'^2 = 3xyy''$
26. $y'' + y^2(y' + 1)^2 = 0$
27. $y'' (2 + yy'^2) + y'^4 = 0$
28. $4yy'' = 3y^2 - 4y'^2$

Задача 9. Решить линейное дифференциальное уравнение методом вариации постоянных

1. $y'' - 2y' + y = e^x/x$

2. $y'' + y = 1/\sin x$

3. $y'' + 4y = 2 \operatorname{tg} x$

4. $y'' - 4y' + 4y = e^{2x}/(x + 1)$

5. $y'' + 9y = 1/\sin^3 3x$

6. $y'' + y = 1/\sin^2 x$

7. $y'' + 4y = 1/\sin 2x$

8. $y'' + 4y = 2 \operatorname{ctg} x$

9. $y'' + 4y' + 4y = e^{-2x}/x^2$

10. $y'' - 6y' + 9y = (x - 2)e^{3x}$

11. $y'' - 2y' + y = xe^x$

12. $y'' + 9y = 1/\sin 3x$

13. $y'' + y = 1/\cos^2 x$

14. $y'' - 6y' + 9y = e^{3x}/(x - 3)$

15. $y'' + 16y = 2 \operatorname{tg} 2x$

16. $y'' + 9y = 1/\cos 3x$

17. $y'' - 4y' + 4y = xe^{2x}$

18. $y'' + 4y = 1/(1 + \cos 4x)$

19. $y'' + 6y' + 9y = e^{-3x}/x^2$

20. $y'' + 4y = 6 \operatorname{ctg} x$

21. $y'' + 6y' + 9y = -e^{-3x}/(x + 3)$

22. $y'' - 4y' + 4y = e^{2x}/x^2$

23. $y'' + 4y' + 4y = -e^{-2x}/(x - 1)$

24. $y'' + y = 2 \sin x / (1 + \cos x)$

25. $y'' - 2y' + y = e^x/(x + 2)$

26. $y'' - 2y' + y = -xe^x$

27. $y'' + 2y' + y = 2e^{-x}/x$

28. $y'' + y = \operatorname{ctg}(x/2)$

Задача 10. Решить линейное дифференциальное уравнение

1. $y'''' - y''' + 4y' - 4y = \sin 2x + e^{2x}$
2. $y'''' + 2y''' + y' + 2y = \cos x + e^{2x}$
3. $y'''' - 3y''' + y' - 3y = \sin x + e^{-3x}$
4. $y'''' + y''' + 9y' + 9y = \sin 2x + e^{-x}$
5. $y'''' - 2y''' + 4y' - 8y = \cos 2x + e^x$
6. $y'''' + y''' + 4y' + 4y = \cos x + e^{-x}$
7. $y'''' - 2y''' + y' - 2y = \cos 2x + e^{2x}$
8. $y'''' + 3y''' + y' + 3y = \sin x + e^{3x}$
9. $y'''' - y''' + 9y' - 9y = \sin 3x + e^{2x}$
10. $y'''' + 2y''' + 4y' + 8y = \sin 3x + e^{-2x}$
11. $y'''' - y''' + 4y' - 4y = \sin 3x + e^x$
12. $y'''' + 2y''' + y' + 2y = \cos 2x + e^{-2x}$
13. $y'''' - 3y''' + y' - 3y = \cos 2x + e^{3x}$
14. $y'''' + y''' + 9y' + 9y = \cos 3x + e^x$
15. $y'''' - 2y''' + 4y' - 8y = \sin x + e^{2x}$
16. $y'''' + y''' + 4y' + 4y = \sin 2x + e^{2x}$
17. $y'''' - 2y''' + y' - 2y = \cos x + e^{-2x}$
18. $y'''' + 3y''' + y' + 3y = \sin 2x + e^{-3x}$
19. $y'''' - y''' + 9y' - 9y = \sin x + e^x$
20. $y'''' + 2y''' + 4y' + 8y = \cos 2x + e^{2x}$
21. $y'''' - y''' + 4y' - 4y = -\cos x - e^x$
22. $y'''' - 3y''' + y' - 3y = \cos 2x + e^{3x}$
23. $y'''' + 3y''' + y' + 3y = \sin x - e^{3x}$
24. $y'''' - y''' + 9y' - 9y = e^x - \sin 2x$
25. $y'''' - 2y''' + 4y' - 8y = e^{2x} - \sin 3x +$
26. $y'''' - 2y''' + y' - 2y = \cos x + e^{-2x}$
27. $3y'''' - y''' + 3y' - y = \sin x + e^{2x/3}$
28. $2y'''' + y''' + 2y' + y = \sin x + e^x$