Řešte diferenciální rovnice: *(separací)*

1. $y' = \frac{y}{x}$ $\quad [y = cx]$
2. $(xy^2 + x)dx + (y - x^2y)dy = 0$ $\quad [1 + y^2 = C(1 - x^2)]$
3. $xyy' = 1 - x^2$ $\quad [x^2 + y^2 = \ln Cx^2]$
4. $y' \operatorname{tg} x - y = a$ $\quad [y = C \sin x - a]$
5. $xydx + (x + 1)dy = 0$ $\quad [y = C(x + 1)e^{-x}]$
6. $\sqrt{y^2 + 1}dx = xydy$ $\quad \left[\ln|x| = C + \sqrt{y^2 + 1}; x = 0\right]$
7. $e^y(1 + x^2)dy - 2x(1 + e^y)dx = 0$ $\quad [1 + e^y = C(1 + x^2)]$
8. $(x^2 - 1)y' + 2xy^2 = 0\,,\ y(0) = 1$ $\quad [y\{\ln(1 - x^2) + 1\} = 1]$
9. $y' \sin x = y \ln y\,,\ y(\frac{\pi}{2}) = e$ $\quad [y = e^{\operatorname{tg} \frac{x}{2}}]$
10. $\sin y \cos x dy = \cos y \sin x dx\,,\ y(0) = \frac{\pi}{4}$ $\quad [\cos x = \sqrt{2} \cos y]$
11. $y' \operatorname{cotg} x + y = 2\,,\ y(\frac{\pi}{3}) = 0$ $\quad [y = 2 - 4 \cos x]$
12. $y'x = y$ $\quad [y = cx]$
13. $y' = y^2$ $\quad \left[y = \frac{1}{C - x}\right]$
14. $y' \sin x + y \cos x = 0$ $\quad \left[y = \frac{c}{\sin x}\right]$
15. $y' = y \cot g x$ $\quad [y = c \sin x]$
16. $y' = 2\sqrt{y}$ $\quad [y = (x + c)^2]$
17. $y' = \frac{x - 2}{y^2}$ $\quad \left[y = \sqrt[3]{\frac{3}{2}(x - 2)^2 + c}\right]$
18. $y' = \frac{y - 1}{x(x - 1)}$ $\quad \left[y = 1 + c\frac{x - 1}{x}\right]$
19. $y' = \frac{1 + y^2}{xy(1 + x^2)}$ $\quad [(1 + x^2)(1 + y^2) = cx^2]$

Řešte lineární diferenciální rovnice: *(variací konstant)*

20. $y' - y = 1.$ $\left[y = -1 + K_1 e^x\right]$
21. $y' - y\dfrac{\cos x}{\sin x} = 2\sin x$ $\left[y = (2x + c)\sin x\right]$
22. $y' - y = x.$ $\left[y = -x - 1 + K_1 e^x\right]$
23. $y' + y = e^x.$ $\left[y = \dfrac{1}{2}e^x + K_1 e^{-x}\right]$
24. $y' + y = e^{-x}.$ $\left[y = xe^{-x} + K_1 e^{-x}\right]$
25. $y' + xy = x$ $\left[y = 1 - ce^{-\frac{x^2}{2}}\right]$
26. $y' + 3y = e^{2x}$ $\left[y = \dfrac{1}{5}e^{2x} + ce^{-3x}\right]$
27. $y' + y = \cos x$ $\left[y = ce^{-x} + \dfrac{1}{2}(\cos x + \sin x)\right]$
28. $x^2 y' + 3 - 2xy = 0$ $\left[y = cx^2 + \dfrac{1}{x}\right]$
29. $xy' - y = x^2$ $\left[y = x^2 + cx\right]$
30. $y' + 4x^3 y = x^2 e^{-x^4}$ $\left[y = \left(\dfrac{x^3}{3} + c\right)e^{-x^4}\right]$
31. $xy' - 2y = 2x^4$ $[y = Cx^2 + x^4]$
32. $xy' + y + 1 = 0$ $[y = Cx - 1]$
33. $xy' + (x+1)y = 3x^2 e^{-x}$ $[xy = (x^3 + C)e^{-x}]$
34. $(xy + e^x)dx - xdy = 0$ $[y = e^x(\ln|x| + C)]$
35. $y = x(y' - x\cos x)$ $[y = x(C + \sin x)]$
36. $(xy' - 1)\ln x = 2y$ $[y = C\ln^2 x - \ln x]$
37. $y\sin x + y'\cos x = 1$ $[y = \sin x + C\cos x]$