Sheet # 0931 FIRST ORDER SEPARABLE DIFFERENTIAL EQUATIONS

INSTRUCTIONS: SOLVE!

NAME: KEY

Period:

1. $\frac{dy}{dx} = 1+x^2$

$y = \int (1+x^2)\,dx = \boxed{x + \frac{x^3}{3} + C}$

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

$\int e^{-y}\,dy = \int x\,dx$

$-e^{-y} = \frac{x^2}{2} + C_1$

$\boxed{y = -\ln\left(-\frac{x^2}{2} + C\right)}$

3. $\frac{dy}{dx} = \frac{1}{y}$

$\int y\,dy = \int 1\,dx$

$\frac{y^2}{2} = x + C_1$

$\boxed{y = \pm\sqrt{2x + C}}$

4. $\frac{dy}{dx} = (\sin x)\,y$

$\int \frac{1}{y}\,dy = \int \sin x\,dx$

$\ln y = -\cos x + C$

$y = e^{-\cos x + C}$

$\boxed{y = Ae^{-\cos x}}$

5. $\frac{dy}{dx} = 1+y^2$

$\int \frac{dy}{1+y^2} = \int 1\cdot dx$

$\tan^{-1} y = x + C$

$\boxed{y = \tan(x+C)}$

6. $\frac{dy}{dx} = x^2 y^2$

$\int \frac{dy}{y^2} = \int x^2\,dx$

$-y^{-1} = \frac{x^3}{3} + C_1$

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

$\boxed{y = \frac{1}{-x^3/3 + C}}$

7. $\frac{dy}{dx} = \sec^2 x$

$\boxed{y = \tan x + C}$

8. $\frac{dy}{dx} = e^x e^y$

$\int e^{-y}\,dy = \int e^x\,dx$

$-e^{-y} = e^x + C_1$

$\boxed{y = -\ln(-e^x + C)}$

9. $\frac{dy}{dx} = \cos^4 x \sin x$

$\boxed{y = \frac{-\cos^5 x}{5} + C}$

10. $\frac{dy}{dx} = -\frac{x}{y}$

$\int y\,dy = \int -x\,dx$

$\frac{y^2}{2} = -\frac{x^2}{2} + C_1$

$\boxed{x^2 + y^2 = C}$

$\boxed{y = \pm\sqrt{C - x^2}}$

11. $\frac{dy}{dx} = \frac{1}{1+x^2}$

$\boxed{y = \tan^{-1} x + C}$

12. $\frac{dy}{dx} = \frac{y}{x}$

$\int \frac{dy}{y} = \int \frac{dx}{x}$

$\ln|y| = \ln|x| + C$

$y = \pm e^{\ln|x| + C}$

$y = \pm Ax$

$\boxed{y = mx}$

13. $\frac{dy}{dx} = ky$

$\int \frac{1}{y}\,dy = \int k\,dx$

$\ln|y| = kx + C$

$y = e^{kx+C}$

$\boxed{y = Ae^{kx}}$

14. $\frac{dy}{dx} = \frac{x}{y^3}$

$\int y^3\,dy = \int x\,dx$

$\frac{y^4}{4} = \frac{x^2}{2} + C_1$

$y^4 = 2x^2 + C$

$\boxed{y = \sqrt[4]{2x^2 + C}}$

15. (Solve for x) $\frac{dy}{dx} = \frac{1}{1+y^2}$

$\int (1+y^2)\,dy = \int dx$

$\boxed{y + \frac{y^3}{3} = x + C_1}$

$\boxed{x = y + \frac{y^3}{3} + C}$

16. $\frac{dy}{dx} = \frac{\cos x}{\sin y}$

$\int \sin y\,dy = \int \cos x\,dx$

$-\cos y = \sin x + C_1$

$\cos y = -\sin x + C$

$\boxed{y = \cos^{-1}(-\sin x + C)}$