S4 GROUPE n

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Exercice 1:

1. $y' = \sin(y)$
2. $x^2 y' = e^y$

$$
\begin{aligned}
x^2 y' &= e^y \\
x^2 \frac{dy}{dx} &= e^y \\
\frac{dy}{e^y} &= \frac{dx}{x^2} \\
\int \frac{1}{e^y}\, dy &= \int \frac{1}{x^2}\, dx \\
\int e^{-y}\, dy &= \int x^{-2}\, dx \\
-e^{-y} &= -\frac{1}{x} + C, \quad C \in \mathbb{R} \\
\ln(e^{-y}) &= \ln|\frac{1}{x} + C| \\
-y &= \ln|\frac{1}{x} + C| \\
y &= -\ln|\frac{1}{x} + C|
\end{aligned}
$$

$$\boxed{y = -\ln|\frac{1}{x} + C|}$$

3. $(x^2+1)y' + 3xy = x^2$
   Etape 1: ESSM

$$
\begin{aligned}
(x^2+1)y' + 3xy &= 0 \\
(x^2+1)y' &= -3xy \\
(x^2+1)\frac{dy}{dx} &= -3xy \\
(x^2-1)\frac{dy}{y} &= -3x\, dx
\end{aligned}
$$

4. $y' + y = 2e^x + 4\sin(x)$
5. $y' - 2y = 2x^3 + x \quad ou \quad y(3) = 1$

6. $y' + 2xy = e^{x-x^2}$
7. $y' \cos(2y) - \sin(y) = 0$
8. $y' - 2y = 2x^3 + x \quad \text{ou} \quad y(3) = 1$

Exercice 2:

1. $xy' = y + 3xy^2$
2. $y' + \frac{y}{x+1} = \frac{1}{2}(x+1)^3 y^3$
3. $y'(1 - \sin(s)\cos(x)) + y^2 \cos(x) - y' + \sin(x) = 0$
   Si $y = \cos(x)$ est une solution particuliere
4. $y = xy' + (y')^3$