Solve the following differential equations, also find singular solutions (if any):

1. $\frac{dy}{dx} = \frac{4xy+3y+4x+3}{2y-3xy-3x+2}$.   Ans: $y = -\frac{4}{3}x - \frac{17}{9}\ln|2-3x| + c$, Singular solution $y = -1$

2. $(5xy - 10x + 3y - 6)dx = (2-x)dy$.   Ans: $y - 2 = c\frac{e^{-5x}}{(2-x)^{13}}$, Singular solution $y = 2$

3. $(x-2y+3)\frac{dy}{dx} = (4y-2x)$.   Ans: $\frac{1}{5}(x-2y) + \frac{12}{25}\ln(5x - 10y + 3) = x + c$, Singular solution is $y = \frac{1}{10}(5x+3)$

4. $\frac{dy}{dx} = \frac{2}{\sqrt{y-2x+3}}$.   Ans: $\frac{1}{2}y + \sqrt{y-2x+3} + \ln\left(1 - \sqrt{y-2x+3}\right) = c$, Singular solution $y = 2(x-1)$

5. $(4 - x + y)dy = (2 - y + x)dx$.   Ans: $x + y + 3\ln(1 - x + y) = c$, Singular solution $y = x - 1$

6. $\sqrt{x+y}\frac{dy}{dx} = \sqrt{1+x+y}$.
Ans: $\frac{(x+y)^2}{2} + \frac{1}{2}(x+y+\frac{1}{2})\sqrt{(x+y)^2 - \frac{1}{4}} + \frac{1}{8}\ln\left(x + y + \frac{1}{2} + \sqrt{(x+y)^2 - \frac{1}{4}}\right) = -x + c$

7. $\frac{dy}{dx} = (y+2x)^{-1}e^{2x+y} - 2$.   Ans: $-(2x + y + 1) = (x + c)e^{(2x+y)}$

8. $\frac{dy}{dx} = \frac{y-2x}{x+2y}$.   Ans: $\ln(x^2 + y^2) + \tan^{-1}\left(\frac{y}{x}\right) = c$

9. $xdy = \left(y + \sqrt{xy}\right)$.   Ans: $2\sqrt{\frac{y}{x}} = \ln x + c$, Singular solution $y = 0$

10. $y\frac{dy}{dx} = x + \sqrt{y^2 - x^2}$.   Ans: $(y^2 - x^2) = (x - c)^2$, Singular solutions $y = \pm x$

11. $(y + xe^{\frac{x}{y}})dy = ye^{\frac{x}{y}}dx$.   Ans: $y = ce^{\frac{x}{y}}$, Singular solution $y = 0$

11. Solve the IVP $xdy + y(\ln y - \ln x - 1)dx = 0$, $y(1) = e$.   Ans: $y = xe^{\frac{1}{x}}$, Singular solution $y = x$