Set 1.6:

32 Bernoulli, $a = -1$, $1 - a = 2$

$$\begin{aligned} u' + 2u &= -2x \\ \frac{du}{u} &= -2dx \\ u &= c(x) \cdot e^{-2x} \\ c'e^{-2x} &= -2x \\ c &= -2\int xe^{2x}dx = \\ & \quad (\tfrac{1}{2} - x)e^{2x} + C \\ u &= \frac{1}{2} - x + Ce^{-2x} \\ y &= \pm\sqrt{\frac{1}{2} - x + Ce^{-2x}} \end{aligned}$$

33 Bernoulli, $a = 4$, $1 - a = -3$

$$\begin{aligned} u' - u &= 2x - 1 \\ \frac{du}{u} &= dx \\ \ln u &= x + \ln c \\ y &= c(x)e^x \\ c'e^x + ce^x - ce^x &= 2x - 1 \\ c' &= (2x - 1)e^{-x} \\ c &= -(2x + 1)e^{-x} + C \\ u &= -(2x + 1) + Ce^x \\ y &= \frac{1}{\sqrt[3]{Ce^x - 2x - 1}} \end{aligned}$$

38 Bernoulli, $a = -1$, $1 - a = 2$

$$\begin{aligned}
2xu' + 2(x-1)u &= 2x^2e^x \\
\frac{du}{u} &= \left(\frac{1}{x} - 1\right)dx \\
u &= c(x) \cdot xe^{-x} \\
x^2e^{-x}c' &= x^2e^x \\
c &= \int e^{2x}dx = \\
&\quad \frac{1}{2}e^{2x} + C \\
u &= \frac{x}{2}e^x + Cxe^{-x} \\
y &= \pm\sqrt{\frac{x}{2}e^x + Cxe^{-x}}
\end{aligned}$$

Set 1.5:

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$$\begin{aligned}
\frac{d\cot y}{dy} &= -\csc^2 y \ \checkmark \\
G &= x\cot y + \frac{x^3}{3} \\
H &= -x\csc^2 y + x\csc^2 y = 0 \\
x\cot y + \frac{x^3}{3} &= \tilde{C} \\
\cot y &= \frac{C - x^3}{3x} \\
y &= \operatorname{arccot}\frac{C-x^3}{3x} = \arctan\frac{3x}{C-x^3}
\end{aligned}$$

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$$\begin{aligned}
2x\exp(x^2) &= 2x\exp(x^2) \quad \text{YES, exact} \\
G &= \int 2xy\exp(x^2)dx = y\exp(x^2) \\
H &= \exp(x^2) - \exp(x^2) \\
y\exp(x^2) &= C \\
y &= C\exp(-x^2) \\
y &= 2\exp(-x^2)
\end{aligned}$$

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$$\begin{aligned}
\frac{6(y+1)}{x^4} &= 6\frac{y+1}{x^4} \quad \checkmark \\
G &= 3(y+1)^2 \int \frac{dx}{x^4} = -\frac{(y+1)^2}{x^3} \\
H &= -2\frac{(y+1)}{x^3} + 2\frac{(y+1)}{x^3} = 0 \\
(y+1)^2 &= \tilde{C}x^3 \\
y &= -1 + Cx^{3/2}
\end{aligned}$$

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$$\begin{aligned}
\frac{-2\sin y - 0}{-\sin y} &= 2 \\
\ln F &= 2x \\
F &= e^{2x} \\
2e^{2x}\cos y\, dx - e^{2x}\sin y\, dy &= 0 \\
G &= e^{2x}\cos y \\
H &= -e^{2x}\sin y + e^{2x}\sin y = 0 \\
e^{2x}\cos y &= C \\
y &= \arccos(Ce^{-2x})
\end{aligned}$$