More D.E. to work... And review...

Solve the following:

① $\frac{dy}{dx} = \frac{e^{2x+3y}}{e^{x-y}}$

② $(3y^2+4xy+x\tan^2 x)dx + (6xy+2x^2+\frac{\ln y}{y})dy = 0$

③ $\frac{dy}{dx} + (\frac{2}{x})y = 3x+2$

④ $(y-1)\sin x\,dx - dy = 0$

⑤ Given: $g(x) = \sqrt[3]{x-4}$ about $c=-4$.
Find the series representation.

⑥ Evaluate: $\int x\csc^6(3x^2)\,dx$

ANS. ① $-\frac{1}{4}e^{-4y} = e^x + C$

② $3xy^2 + 2x^2y + x\tan x + \ln|\cos x| + \frac{1}{2}(\ln y)^2 - \frac{1}{2}x^2 = C$

③ $y = \frac{3}{4}x^2 + \frac{2}{3}x + \frac{C}{x^2}$

④ $y = 1 + Ce^{-\cos x}$

⑤ $g(x) = -2 + \frac{(x+4)}{12} + \sum_{n=2}^{\infty} \frac{2\cdot 5\cdot 8\cdots(3n-4)}{3^n 2^{3n-1} n!}(x+4)^n$

⑥ $-\frac{1}{6}\cot(3x^2) - \frac{1}{9}\cot^3(3x^2) - \frac{1}{30}\cot^5(3x^2) + C$