Classify each differential equation as to its type (separable, linear, Bernoulli, etc) and solve it. Each of these works out cleanly, so take your time and compute carefully. Some of these require substitutions, so re-read the section on substitutions in our book, or look at the section on substitutions in Paul’s Online Notes. You might also consider dividing by the dependent or independent variable. On some just a little algebra will simplify them.

1. \( xy' + 2x^2y = y^2x^{-2}e^{x^{-2}+x^2} \) where \( y(1) = 1 \).
2. \( xz' + 2z \ln x - 2x^2z = 0 \) where \( z(0) = 2 \).
3. \( ty' + y - t^2(1 + e^t)y^2 = 0 \).
4. \( \dot{p} = \frac{t^2+p^2}{tp} \)
5. \( (y' - y/x)^2 = e^{y+x} \)