

Homework 1 Solutions

1. The following direction fields match equations:
 - a) – 7)
 - b) – 2)
 - c) – 9)
 - d) – 10)
 - e) – 5)
 - f) – 4)
2.
 - (a) 1st order, nonlinear
 - (b) 4th order, linear
 - (c) 2nd order, linear
 - (d) 2nd order, nonlinear
 - (e) 2nd order, nonlinear
 - (f) 3rd order, linear
3.
 - (a) Integrating factor method $\mu = e^{x^{-2}}$, or separation yield $y = Ce^{-x^{-2}}$
 - (b) Integrating factor method yields $\mu = e^{-x^{-2}}$, hence $y = Ce^{x^{-2}}$, and $y(2) = 3 \Rightarrow C = 3e^{-1/4}$
 - (c) As above, the integrating factor method yields $\mu = e^{-x^{-2}}$, hence $y = Ce^{x^{-2}}$, but $y(0) = 3$ leads to a contradiction. Indeed, $2/x^3$ is not continuous at the initial point $x = 0$. This IVP has no solution.
 - (d) The integrating factor method yields $\mu = x^2$, hence

$$y = \frac{\sin(x) + C}{x^2}$$