1.1 Exercises

Problem 1 Verify by substitution that $y_1 = 0$ and $y_2 = \frac{\ln x}{x^2}$ are solutions to $x^2y'' + 5xy' + 4y = 0$.

Problem 2 Verify that $y(x) = x^3(C + \ln x)$ satisfies $xy' - 3y = x^3$.

Then, determine a value of the constant C so that $y(x)$ satisfies the initial condition $y(1) = 17$.

Problem 3 When a graph of $g(x)$ intersects the graphs of functions with the form $y = x^2 + k$ (k is any constant), it does so perpendicularly (the two graphs are normal to each other). Write a DEQ of the form $g' = f(x)$ having the function g as its solution (or as one of its solutions).

Problem 4 Write a DEQ that is a mathematical model of the following situation.

There is a city which has a fixed population of P people.

N is the number of persons who have heard a certain rumor.

The time rate-of-change of N, is proportional to the number of those who have not heard the rumor.