

The following problems are from the 7th Edition of Boyce and DiPrima. They are from Section 3.1, Exercises 35, 38.

For problems 35 and 38, use the following method:

Equations with the Independent Variable Missing. If a second order differential equation has the form $y'' = f(y, y')$, then the independent variable t does not appear explicitly, but only through the dependent variable y . If we let $v = y'$, then we obtain $dv/dt = f(y, v)$. Since the right side of this equation depends on y and v , rather than on t and v , this equation is not of the form of the first order equations discussed in Chapter 2. However, if we think of y as the independent variable, then by the chain rule

$$dv/dt = (dv/dy)(dy/dt) = v(dv/dy).$$

Hence the original differential equation can be written as $v(dv/dy) = f(y, v)$. Provided that this first order equation can be solved, we obtain v as a function of y . A relation between y and t results from solving $dy/dt = v(y)$. Again, there are two arbitrary constants in the final result. In each of Problems 34 through 39 use this method to solve the given differential equation.

35. $y'' + y = 0$.

38. $yy'' - (y')^3 = 0$.