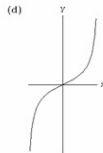


1.1 Definitions and Terminology



55. In *Mathematica* use

```
Clear[y]
y[x_]:= x Exp[5x] Cos[2x]
y[x]
y''''[x] - 20y''''[x] + 158y''[x] - 580y'[x] + 841y[x]//Simplify
```

The output will show $y(x) = e^{5x}x \cos 2x$, which verifies that the correct function was entered, and 0, which verifies that this function is a solution of the differential equation.

56. In *Mathematica* use

```
Clear[y]
y[x_]:= 20Cos[5Log[x]]/x - 3Sin[5Log[x]]/x
y[x]
x^3 y''''[x] + 2x^2 y''[x] + 20x y'[x] - 78y[x]//Simplify
```

The output will show $y(x) = 20 \cos(5 \ln x)/x - 3 \sin(5 \ln x)/x$, which verifies that the correct function was entered, and 0, which verifies that this function is a solution of the differential equation.

EXERCISES 1.2

Initial-Value Problems

1. Solving $-1/3 = 1/(1 + c_1)$ we get $c_1 = -4$. The solution is $y = 1/(1 - 4e^{-x})$.
2. Solving $2 = 1/(1 + c_1 e)$ we get $c_1 = -(1/2)e^{-1}$. The solution is $y = 2/(2 - e^{-(x+1)})$.
3. Letting $x = 2$ and solving $1/3 = 1/(4 + c)$ we get $c = -1$. The solution is $y = 1/(x^2 - 1)$. This solution is defined on the interval $(1, \infty)$.
4. Letting $x = -2$ and solving $1/2 = 1/(4 + c)$ we get $c = -2$. The solution is $y = 1/(x^2 - 2)$. This solution is defined on the interval $(-\infty, -\sqrt{2})$.
5. Letting $x = 0$ and solving $1 = 1/c$ we get $c = 1$. The solution is $y = 1/(x^2 + 1)$. This solution is defined on the interval $(-\infty, \infty)$.

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