1 Suppose that $P(x)$ and $Q(x)$ are continuous on the interval $(1, 10)$. Suppose also that $y_A$, $y_B$, and $y_C$ are solutions of the differential equation

$$y'' + P(x)y' + Q(x)y = 0$$

on the interval $(1, 10)$. Suppose also that we have the following list of initial conditions:

(A) $y(2) = 3$ and $y'(2) = -2$,

(B) $y(2) = -6$ and $y'(2) = 4$,

(C) $y(2) = 0$ and $y'(2) = 5$.

Assume $y_A$ satisfies condition (A), $y_B$ satisfies condition (B), and $y_C$ satisfies condition (C).

(a) Explain whether $\{y_A, y_B\}$ is a fundamental set of solutions:

(b) Explain whether $\{y_A, y_C\}$ is a fundamental set of solutions:

(c) Explain whether $\{y_B, y_C\}$ is a fundamental set of solutions:
2. Show steps in finding a general-solution formula for the differential equation

\[ y'' - y' - 6y = 104 \cos(2t). \]
Show steps in finding a general-solution formula for the differential equation \( y'' - y' - 6y = 30e^{4t} \). Give a solution for the initial conditions \( y(0) = 10 \), \( y'(0) = -5 \).
4. Show steps in finding the value of $y(18)$ if

$$x y' + y = E(x),$$

while $y(1) = 5$, and

$$E(x) = \begin{cases} 
4, & \text{if } 1 \leq x \leq 2 \\
0, & \text{if } 2 < x < \infty 
\end{cases}$$
Here’s a list of second-order linear differential equations.

(A) \( y'' + 6y' + 18y = 0 \)

(B) \( y'' - 6y' + 18y = 0 \)

(C) \( y'' - 4y = 0 \)

(D) \( y'' + 4y = 0 \)

Each of the figures below shows a portion of the graph of a solution of one of the above differential equations. The graphs are sloppy in that each one probably uses a different scale from the others. Even so, you should be able to match solution with differential equation by entering the letter of the appropriate differential equation from the above list in the box in the lower-right part of each figure.