Week 5: Second Order Linear Equations

Welcome to the Weekly Review for MATH 2420. This week’s review talks about Second Order Linear Equations. We would like to thank Patrick Bourque and the Spring 2015 MATH 2420 students for allowing us to film the Weekly Reviews.

The following problems are presented in the Week 5 videos. Thank you!

Part A: Second Order Linear Equations

1. Background Information

2. Show that the two sets are both fundamental solution sets of the differential equation. Which one would you rather work with?

\[ S_1 = \{ e^x, e^{2x} \} \quad S_2 = \{ e^x - e^{2x}, 3e^x + e^{2x} \} \quad y'' - 3y' + 2y = 0 \]
3. Given $W(f, g) = e^{4x}$, find $W(f + g, f - g)$.

4. Given $W(y, y^2) = e^{3x}$ and $y(0) = 1$, find $y(x)$.

5. Show that $g(x) = C(f(x) + h(x))$ given $W(f, g) = W(g, h)$.
Part B: Able’s Theorem

1. Able’s Theorem
2. Given $xy'' + (2x^2 + 1)y' + xy = 0$. Find $W(y_1, y_2)$
3. Given \((x^2 + 1)y'' + 2xy' + y = 0\). Find \(W(y_1, y_2)\)

Part C: Reduction of Order

1. Background Information
2. Knowing $y_1 = e^x$ is a solution to $xy'' - (x + 1)y' + y = 0$. Find $y_2$. 
3. Knowing $y_1 = x^{-2}$ is a solution to $x^2 y'' + 6xy' + 6y = 0$. Find $y_2$. 
4. Knowing \( y_1 = \tan(x) \) is a solution to \( y'' - \tan(x)y' - \sec^2(x)y = 0 \). Find \( y_2 \).