Key concept: Let \( y_1(t) \) and \( y_2(t) \) are two solutions of \( L[y] = y'' + p(t)y' + q(t)y = 0, \ \alpha < t < \beta \). \( y_1(t) \) and \( y_2(t) \) form a fundamental set of solutions to the differential equation (or \( y(t) = c_1y_1(t) + c_2y_2(t) \) is a general solution) if \( W(y_1, y_2)(t_0) \) is NOT zero for some point \( t_0 \), where \( \alpha < t_0 < \beta \).

**Theorem 3.2.5** Consider the differential equation \( L[y] = y'' + p(t)y' + q(t)y = 0 \), whose coefficients \( p(t) \) and \( q(t) \) are continuous on an open interval \( I: \alpha < t < \beta \). Choose some point \( t_0 \) in \( I \).

Let \( y_1(t) \) be the solution of \( L[y] = 0 \) that also satisfies the initial conditions \( y(t_0) = 1, y'(t_0) = 0 \).

Let \( y_2(t) \) be the solution of \( L[y] = 0 \) that also satisfies the initial conditions \( y(t_0) = 0, y'(t_0) = 1 \).

Then \( y_1(t) \) and \( y_2(t) \) form a fundamental set of solutions of \( L[y] = 0 \).
Theorem 3.2.6 (Abel’s Theorem). If $y_1(t)$ and $y_2(t)$ are solutions of the differential equation $L[y] = y'' + p(t)y' + q(t)y = 0$, whose coefficients $p(t)$ and $q(t)$ are continuous on an open interval $I: \alpha < t < \beta$. Then the Wronskian $W(y_1, y_2)(t)$ is given by $W(y_1, y_2)(t) = C \exp\left[- \int p(t)dt\right]$, where $C$ is a certain constant that depends on $y_1(t)$ and $y_2(t)$ but NOT on $t$. Further, $W(y_1, y_2)(t)$ either is zero for all $t$ in $I$ (if $C = 0$) or else is never zero in $I$ (if $C \neq 0$).