1: \( y'' - 6y' + 8y = 0 \). The auxiliary equation is \( r^2 - 6r + 8 = 0 \). The roots are \( r = 2, 4 \). Hence the general solution is
\[
y(x) = c_1 e^{2x} + c_2 e^{4x}
\]

2: \( y'' - 4y' + 8y = 0 \). The auxiliary equation is \( r^2 - 4r + 8 = 0 \). The roots are \( r = (4 \pm \sqrt{-16})/2 = 2 \pm 2i \). Hence the general solution is
\[
y(x) = e^{2x}(c_1 \cos 2x + c_2 \sin 2x)
\]

6: \( 3y'' - 5y' = 0 \). The auxiliary equation is \( 3r^2 - 5r = 0 \). The roots are \( r = 0, \frac{5}{3} \). Hence the general solution is
\[
y(x) = c_1 + c_2 e^{5x/3}
\]

9: \( 4y'' + y' = 0 \). The auxiliary equation is \( 4r^2 + r = 0 \). The roots are \( r = 0, -4 \). Hence the general solution is
\[
y(x) = c_1 + c_2 e^{-4x}
\]

17: \( 2y'' + 5y' + 3y = 0 \). The auxiliary equation is \( 2r^2 + 5r + 3 = 0 \). The roots are \( r = -1, -3/2 \). Hence the general solution is
\[
y(x) = c_1 e^{-x} + c_2 e^{-3x/2}
\]
So \( y'(x) = -c_1 e^{-x} - (3/2)c_2 e^{-3x/2} \). Plugging in the initial conditions \( y(0) = 3, y'(0) = -4 \), we get the equations
\[
c_1 + c_2 = 3 \quad ; \quad -c_1 - (3/2)c_2 = -4
\]
The solution is \( c_1 = 1, c_2 = 2 \). The solution to our initial value problem is \( y(x) = e^{-x} + 2e^{-3x/2} \).

19: \( 4y'' - 4y' + y = 0 \). The auxiliary equation is \( 4r^2 - 4r + 1 = 0 \). The roots are \( r = 1/2, 1/2 \). Hence the general solution is
\[
y(x) = c_1 e^{x/2} + c_2 x e^{x/2}
\]
So \( y'(x) = c_1 e^{x/2} + c_2 e^{x/2} + (c_2/2)x e^{x/2} \). Plugging in the initial conditions \( y(0) = 1, y'(0) = -1.5 \), we get the equations
\[
c_1 = 1 \quad ; \quad c_1 + c_2 = -1.5
\]
The solution is \( c_1 = 1, c_2 = -2.5 \). The solution to our initial value problem is thus \( y(x) = e^{x/2} - 2.5x e^{x/2} \).