Quiz 10

Name: Solution key

Answer all questions in a clear and concise manner. Unsupported answers will receive *no credit*.

1. Find the two values of s such that $y = e^{sx}$ is a solution to the differential equation

$$y'' - 2y' - 3y = 0$$

by substituting the equation for y and solving the resulting quadratic. Find a sum of constant multiples of your solutions (so an equation of the form $y = c_1 e^{s_1 x} + c_2 e^{s_2 x}$ for some constants c_1 and c_2) that obeys the initial conditions $y(0) = 2$ and $y'(0) = 2$.

Substitute: $s^2 e^{sx} - 2s e^{sx} - 3 e^{sx} = 0$

$e^{sx}(s^2 - 2s - 3) = 0$

$(s - 3)(s + 1) = 0$

$\boxed{s = -1, \; s = 3}$

$y = c_1 e^{-x} + c_2 e^{3x}$

$y(0) = 2 = c_1 + c_2$

$y'(0) = -c_1 + 3c_2 = 2$

$4 = 4c_2$

$c_2 = 1$

$c_1 = 1$