

## Quiz 10

MATH 1B, SPRING 2012

April 20, 2012

GSI: Zvi Rosen

---

### SOLUTION

---

**Solve the second-order differential equation:**

$$y'' - 6y' + 9y = 0.$$

**with the boundary conditions  $y(0) = 1$ , and  $y(1) = 0$ .**

---

The auxiliary equation is:

$$r^2 - 6r + 9 = (r - 3)^2 = 0.$$

Because of the repeated root  $r = 3$ , the form of the solution is:

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

We plug in the boundary conditions to determine the values of the arbitrary constants.

$$c_1 e^0 + c_2(0)e^0 = c_1 = 1.$$

$$c_1 e^3 + c_2(1)e^3 = (1 + c_2)e^3 = 0 \Rightarrow c_2 = -1.$$

Therefore, the solution to the differential equation is:

$$y(x) = e^{3x} - x e^{3x}.$$