Quiz 3

1. $xy'' + 2xy' + 6e^x y = 0$ $\qquad r(r-1) = 0$

$r = 0, r = 1$

$$y'' + \frac{2}{x} y' + \frac{6e^x}{x} y = 0$$

$$p_0 = \lim_{x \to 0} x \cdot \frac{2}{x} = 0$$

$$q_0 = \lim_{x \to 0} x^2 \cdot \frac{6e^x}{x} = y = 0$$

2. $y'' + y = 3 \qquad y(0) = 2, \; y'(0) = 1$

$$s^2 Y - s y(0) - y'(0) + Y = \frac{3}{s}$$

$$(s^2 + 1) Y = 2s + 1 + \frac{3}{s}$$

$$Y = \frac{2s}{s^2+1} + \frac{1}{s^2+1} + \frac{3}{s(s^2+1)}$$

$$\frac{3}{s(s^2+1)} = \frac{A}{s} + \frac{Bs + C}{s^2+1}$$

$$3 = A(s^2+1) + (Bs + C)(s)$$

$$3 = As^2 + A + (A+B)s^2 + Cs + A$$

$A = 3, \quad B = -3 \quad C = 0$

$$Y = \frac{2s}{s^2+1} + \frac{1}{s^2+1} + \frac{3}{s} - \frac{3s}{s^2+1}$$

$$= -\cos t + \sin t + 3$$