4.3 Auxiliary Equations with Complex Roots

Name: Date: June 4, 2013

P 9. Find a general solution to

$$y'' + 4y' + 8y = 0.$$

P 16. Find a general solution to

$$y'' - 3y' - 11y = 0.$$

P 21. Solve

$$y'' + 2y' + 2y = 0,$$

given that $y(0) = 2$ and $y'(0) = 1$.

P 25. Solve

$$y'' - 2y' + 2y = 0,$$

given that $y(\pi) = e^{\pi}$ and $y'(\pi) = 0$.

P 28. To see the effect of changing the parameter b in the initial value problem

$$y'' + by' + 4y = 0; \quad y(0) = 1, \quad y'(0) = 0,$$

solve the problem for $b = 5, 4$, and 2 and sketch the solutions.

P 32. Vibrating Spring without Damping. A vibrating spring without damping can be modeled by the initial value problem

$$my''(t) + by'(t) + ky(t) = 0,$$

by taking $b = 0$.

(a) If $m = 10$ kg, $k = 250\text{kg/sec}^2$, $y(0) = 0.3$ m, and $y'(0) = -0.1$ m/sec, find the equation of motion for this undamped vibrating spring.

(b) When the equation of motion is of the form

$$y(t) = c_1 e^{\alpha t} \cos \beta t + c_2 e^{\alpha t} \sin \beta t,$$

the motion is said to be **oscillatory** with **frequency** $\beta/2\pi$. Find the frequency of oscillation for the spring system of part (a).