MATH 240 SPRING 2015

EXAM 2

Problem 1. (4 pts)

Your name:

Recitation instructor name:

Recitation time:

Problem	1	2	3	4	5	6	7	Total
Grade								

Trigonometry reminder:

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\sin(x)$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos(x)$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0

Problem 2. (16 pts) Consider the initial value problem

$$\frac{dy}{dx} = x + y^2, \quad y(0) = 0.$$

Find the Picard iterations $y_1(x)$ and $y_2(x)$ for this problem, starting with $y_0 = 0$.

Problem 3. (16 pts) Solve the initial value problem

$$y'' - 6y' + 9y = 0, \quad y(0) = 1, \quad y'(0) = 0.$$

Problem 4. (16 pts) Find the general *real* solution of the equation

$$y'' + 2y' + 10y = 0.$$

Problem 5. (16 pts) Solve the initial value problem

$$y'' + 5y' - 6y = 3e^x, \quad y(0) = y'(0) = 0.$$

Problem 6. (16 pts) Solve the initial value problem

$$\ddot{x} + 5\dot{x} + 6x = 30cos(6t), \quad x(0) = \dot{x}(0) = 0.$$

Problem 7. (16 pts) Suppose an undamped spring-mass system has a mass of 60 g and resonates at a frequency of 0.5 Hz (that is, $0.5\frac{\text{cycles}}{\text{sec}}$). A damping mechanism is then attached to the system, and it is observed that the free damped motion of the system is quasi-periodic with a period of 2.5 sec. What is the spring constant of the system? What is the damping constant of the attached mechanism?