

**Math 277 01,
the course of Dr. Mihailovs**

Midterm 3

November 20, 1998

Name _____

Problem	1	2	3	4	5	6	7	8	9	Extra	Total
Points											

1. Determine values of b , for which the oscillator $\ddot{x} + 2b\dot{x} + x = 0$ is overdamped, underdamped, or critically damped.

2. For what value of ω the harmonic oscillator $\ddot{x} + x = \cos \omega t$ has resonance solutions?

3. Determine whether the system $\dot{x} = 2x^2 \cos y + 6y \cos x$, $\dot{y} = 3y^2 \sin x - 4x \sin y$ is Hamiltonian. If so, find a Hamiltonian function.

4. A 2×2 matrix A has an eigenvalue 3. Find another eigenvalue of A if the system $\dot{\mathbf{x}} = A\mathbf{x}$ is Hamiltonian.

5. Solve the initial-value problem $y' = \frac{2x^2+y^2}{xy}$, $y(1) = 1$.

6. Solve the initial-value problem $2xy' + y = x^2y^5$, $y(1) = 1$.

7. Solve the difference initial-value problem $a_{n+1} = a_n + 6a_{n-1}$, $a_0 = 2$,
 $a_1 = 1$.

8. Solve the difference equation $a_{n+1} = a_n + 6a_{n-1} - 6$.

9. Solve the initial-value difference problem $a_{n+1} = 5a_n + 4b_n$, $b_{n+1} = b_n - a_n$, $a_0 = 2$, $b_0 = 3$.