

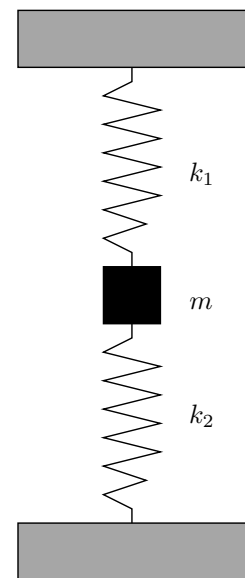
Print Name: _____

Math 305

Test 2

Scientific Calculators Allowed

- [20 points] Find the general solution to $y'' - 3y' - 4y = 4t^2 - 1$.
- [20 points] Find the general solution to $y'' + y = \tan t$.
- [20 points] Find the general solution to $y'' - 4y' + 4y = 3e^{2t}$.
- [20 points] Consider $t^2y'' + 2ty' - 2y = 0$, ($t > 0$).
 - [5 points] Verify that $y_1(t) = t$ is a solution.
 - [10 points] Find a second solution $y_2(t)$ that is of the form $v(t)y_1(t)$.
 - [5 points] Use the Wronskian to show that the given $y_1(t)$ and your $y_2(t)$ are linearly independent.
- [10 points] Find the first 4 terms of the series solution for $y'' + xy' + y = 0$, $y(0) = 1$, $y'(0) = 0$.
- [10 points] Consider the mass-spring configuration below. Let $u(t)$ be the displacement of the mass from equilibrium. Construct a differential equation that models this system. Assume there is no damping.



Bonus [5 points]: What simplified physical situation does your equation correspond to?