

Exam #2 (Monday, April 6)

Exam is open book, open notes; calculators are allowed for built-in arithmetical operations, not for calculus functions nor any programs you added. Show all work, but cross out any work that you do not want considered for grading. Numerical answers need not be simplified; numbers like $2/\sqrt{5}$ or $\sin^{-1}(1/3)$ in your solutions are best left as is. **However, your answers should not involve complex numbers.** Check your answers when possible; if your answer does not satisfy the equations in the problem statement, and you can't find your error, at least indicate that you know there's an error. There are 5 problems, and each is worth 10 points.

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1. Solve the initial value problem

$$y'' + 9y = 0, \quad y(0) = -1, \quad y'(0) = 4.$$

Also, determine the amplitude of the solution.

2. Find the general solution to the equation

$$y'' + 2y' + 3y = 5t + \cos 3t.$$

3. Let f be a continuous function. Solve the initial value problem

$$y'' + y' = f(t); \quad y(0) = 0, \quad y'(0) = 0.$$

Your solution should include one or more definite integrals involving f .

4. Find the first four terms in the Taylor series for the solution of the initial value problem

$$y'' + 2y' + ty = 0, \quad y(0) = 3, \quad y'(0) = -5.$$

5. Find the Laplace transform of the solution to the initial value problem

$$y'' + 2y' + 3y = \begin{cases} 0, & 0 \leq t < 4 \\ 5e^{-6t}, & 4 \leq t < \infty \end{cases}; \quad y(0) = -7, \quad y'(0) = 8.$$