Alternate 4

**Directions:** Answer the questions below. Then log into CourseWare at [http://www.casa.uh.edu](http://www.casa.uh.edu) and submit your answers using the EMCF entitled *Alternate04.* You might need to read section 3.6 and/or watch Monday’s video posting to answer the first 10 questions.

**Note:** For questions 1-19, enter either a or b for your response.

1. Newton’s second law and Hooke’s law are essential to the derivation of the differential equation used to model spring-mass systems.
   a. True
   b. False
2. The spring-mass differential equation \( my'' + ky = 0 \) results when damping is present, but there is no friction or external force.
   a. True
   b. False
3. The external force \( F \) in the spring-mass system \( my'' + \delta y' + ky = F(t) \) can be visualized as a movement of the form \( \frac{1}{k} F(t) \) in the end opposite from the mass, as the mass moves.
   a. True
   b. False
4. The spring-mass differential equation \( my'' + ky = 0 \) results when no damping or external forces are present.
   a. True
   b. False
5. Solutions of the spring-mass differential equation \( my'' + ky = 0 \) are always periodic.
   a. True
   b. False
6. Solutions of the spring-mass differential equation \( my'' + ky = 0 \) can always be written in the form \( A \sin(\omega t + \phi_0) \) for some constants \( A \) and \( \phi_0 \).
   a. True
   b. False
7. The equation \( 25y'' + 10y' + 5y = 0 \) is
   a. Under damped
   b. Critically damped
   c. Over damped
8. The equation \( 25y'' + 30y' + 5y = 0 \) is
   a. Under damped
   b. Critically damped
   c. Over damped
9. The equation \( 450y'' + 30y' + 5y = 0 \) is
   a. Under damped
   b. Critically damped
   c. Over damped

10. Bridges and other structures can become unstable when the natural vibrations of the system are not sufficiently damped and external forces match the period of the vibrations.
   a. True
   b. False

11. The general solution to \( y'''' - 2y'' + 3y' + y = 0 \) can be found by finding the roots of \( r^3 - 2r^2 + 3r + 1 \).
   a. True
   b. False

12. A particular solution to \( y^{(4)} - y = \sin(x) + 2e^{-2x} \) can be found in the form \( A\cos(x) + B\sin(x) + Ce^{-2x} \).
   a. True
   b. False

13. The Laplace transform is a linear transformation.
   a. True
   b. False

14. The Laplace transform of the product of two functions is always the product of the Laplace transforms of the functions.
   a. True
   b. False

15. It is possible to find the Laplace transform of a solution to a linear, constant coefficient initial value problem without actually finding the solution.
   a. True
   b. False

16. \( L\left[y'(x)\right] = y(0) + sL[y(x)] \)
   a. True
   b. False

17. \( L[5e^{-7x}] = \)
   a. \( \frac{5}{s+7}, s > 7 \)
   b. \( \frac{5}{s-7}, s > 7 \)
   c. \( \frac{5}{s-7}, s > -7 \)
   d. \( \frac{5}{s+7}, s > -7 \)
   e. None of these.
18. A table of Laplace transform formulas will be provided on the midterm exam.
   a. True
   b. False
19. A review problem set for the midterm exam is posted on the course homepage.
   a. True
   b. False
20. The answer is 1.235.