Question #1 Pick 1 questions, 0 pts per question

Question

(7 points) 1. Solve the following differential equation by using variation of parameters: $y'' - 4y' + 5y = e^{2x} \tan x$

Question #2 Pick 1 questions, 0 pts per question

Question

(4 points) 2. Solve the following differential equation:
$3x^2y'' + 7xy' + 2y = 0$

Question

(4 points) 2. Solve the following differential equation:
$2x^2y'' + 7xy' + 3y = 0$

Question #3

Pick 1 questions, 0 pts per question

Question

(4 points) 3. Solve the following differential equation:

$2x^2y'' - 2xy' + 3y = 0$

Question

(4 points) 3. Solve the following differential equation:

$3x^2y'' - 2xy' + 4y = 0$

Question 4

Pick 1 questions, 0 pts per question

Question

(4 points) 4. Solve the following differential equation:

$9x^2y'' - 15xy' + 16y = 0$

Question

(4 points) 4. Solve the following differential equation:

$16x^2y'' - 8xy' + 9y = 0$

Question #5 Pick 1 questions, 0 pts per question

Question

(7 points) 5. Solve the following differential equation by using variation of parameters: $x^2y'' + 4xy' + 2y = 4\ln x$

Question #6 Pick 1 questions, 0 pts per question

Question

6. A mass weighing 32 pounds stretches a spring 2 feet. The mass is initially released from a point 1 foot above the equilibrium position with an upward velocity of 5 ft/s.

(7 points) a. Find the equation of motion, $x(t)$. (g = 32 ft/s^2)

(2 points) b. Write the equation in the form $x(t) = A\sin(\omega t + \phi)$.

Question

6. A mass weighing 32 pounds stretches a spring 2 feet. The mass is initially released from a point 1 foot above the equilibrium position with an upward velocity of 6 ft/s.

(7 points) a. Find the equation of motion, $x(t)$. (g = 32 ft/s^2)

(2 points) b. Write the equation in the form $x(t) = A\sin(\omega t + \phi)$.

Question #7 Pick 1 questions, 0 pts per question

Question

7. A force of 5 pounds stretches a spring 1 foot. A mass weighing 6.4 pounds is attached to the spring, and the system is then immersed in a medium that offers a damping force numerically equal to 1.6 times the instantaneous velocity.

(7 points) a. Find the equation of motion if the mass is initially released from rest from a point 1 foot above the equilibrium position. ($g = 32$ ft/s^2)

(1 point) b. What type of motion is this?

Question

7. A force of 4 pounds stretches a spring 1 foot. A mass weighing 3.2 pounds is attached to the spring, and the system is then immersed in a medium that offers a damping force numerically equal to 0.4 times the instantaneous velocity.

(7 points) a. Find the equation of motion if the mass is initially released from rest from a point 1 foot above the equilibrium position. ($g = 32$ ft/s^2)

(1 point) b. What type of motion is this?

Question #8 Pick 1 questions, 0 pts per question

Question

8. A mass weighing 4 pounds is attached to a spring whose constant is 2 lb/ft. The medium offers a damping force that is numerically equal to the instantaneous velocity. The mass is initially released from a point 1 foot above the equilibrium position with a downward velocity of 12 ft/s. ($g = 32$ ft/s^2)

(7 points) a. Find the equation of motion.

(1 point) b. What type of motion is this?

(2 points) c. Determine the time at which the mass passes through the equilibrium position.

Question

8. A mass weighing 4 pounds is attached to a spring whose constant is 2 lb/ft. The medium offers a damping force that is numerically equal to the instantaneous velocity. The mass is initially released from a point 1 foot above the equilibrium position with a downward velocity of 16 ft/s. ($g = 32$ ft/s^2)

(7 points) a. Find the equation of motion.

(1 point) b. What type of motion is this?

(2 points) c. Determine the time at which the mass passes through the equilibrium position.

Question #9 Pick 1 questions, 0 pts per question

Question

9. Given an LRC-series circuit where the inductance is $\frac{5}{2}$ henry, the resistance is 10 ohms, the capacitance is $\frac{1}{20}$ farad, and the electromotive force is $E(t) = 400\ V$.

(7 points) a. If $q(0) = 0$ and $i(0) = 0$, find the charge on the capacitor, $q(t)$.

(2 points) b. Find the current, $i(t)$.

Question

9. Given an LRC-series circuit where the inductance is $\frac{5}{4}$ henry, the resistance is 10 ohms, the capacitance is $\frac{1}{40}$ farad, and the electromotive force is $E(t) = 200\ V$.

(7 points) a. If $q(0) = 0$ and $i(0) = 0$, find the charge on the capacitor, $q(t)$.

(2 points) b. Find the current, $i(t)$.

Question #10 Pick 1 questions, 0 pts per question

Question

(3 points) 10. Find the Laplace transform:
$\mathcal{L}\{7t^4 + 4\cosh(2t) + 5e^{2t}\sin(3t)\}$

Question

(3 points) 10. Find the Laplace transform:
$\mathcal{L}\{5t^3 + 7\sinh(2t) + 2e^{3t}\sin(4t)\}$

Question #11 Pick 1 questions, 0 pts per question

Question

(3 points) 11. Find the inverse Laplace transform: $\mathcal{L}^{-1}\{\frac{2s+3}{s^2+4s+13}\}$

Question

(3 points) 11. Find the inverse Laplace transform: $\mathcal{L}^{-1}\{\frac{2s+7}{s^2+8s+65}\}$

Question #12 Pick 1 questions, 0 pts per question

Question

(7 points) 12. Solve the following initial-value problem by using Laplace transforms: $y'' + y' - 2y = 10e^{-t},\ \ y(0) = 0,\ \ y'(0) = 1$

Question #13 Pick 1 questions, 0 pts per question

Question

(3 points) 13. Given the function $f(t) = 2 + 3\,\mathcal{U}(t-2) + t\,\mathcal{U}(t-4)$. Find the Laplace transform $\mathcal{L}\{f(t)\}$.

Question #14 Pick 1 questions, 0 pts per question

Question

(2 points) 14. Find the inverse Laplace transform: $\mathcal{L}^{-1}\{\frac{1}{s-3}e^{-4s}\}$

Question

(2 points) 14. Find the inverse Laplace transform: $\mathcal{L}^{-1}\{\frac{1}{s-4}e^{-3s}\}$