Math 2C03 2021 Practice pb set #6 (18557225)

Question 1 2 3 4 5 6 7 8 9

1. Question Details ZillDiffEQ9 4.R.019. [3748845]

Use the procedures developed in this chapter to find the general solution of the differential equation. (Let x be the independent variable.)

$$y''' + 8y'' + 16y' = 0$$

$y =$

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2. Question Details ZillDiffEQ9 4.R.033. [3894150]

Write down the form of the general solution $y = y_c + y_p$ of the given differential equation in the two cases $\omega \neq \alpha$ and $\omega = \alpha$. Do not determine the coefficients in y_p.

$$y'' + \omega^2 y = \sin(\alpha x)$$

$\omega \neq \alpha$ $y =$

$\omega = \alpha$ $y =$

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3. Question Details ZillDiffEQ9 5.1.003.EP. [4603946]

A mass weighing 24 pounds, attached to the end of a spring, stretches it 4 inches. Initially, the mass is released from rest from a point 4 inches above the equilibrium position.

Give the initial conditions. (Use $g = 32$ ft/s^2 for the acceleration due to gravity.)

$x(0) =$ ft

$x'(0) =$ ft/s

Find the equation of motion.

$x(t) =$ ft

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4. Question Details ZillDiffEQ9 5.1.005. [4568322]

A mass weighing 20 pounds stretches a spring 6 inches. The mass is initially released from rest from a point 9 inches below the equilibrium position.

(a) Find the position x of the mass at the times $t = \pi/12$, $\pi/8$, $\pi/6$, $\pi/4$, and $9\pi/32$ s. (Use $g = 32$ ft/s^2 for the acceleration due to gravity.)

$x(\pi/12) =$ ft

$x(\pi/8) =$ ft

$x(\pi/6) =$ ft

$x(\pi/4) =$ ft

$x(9\pi/32) =$ ft

(b) What is the velocity of the mass when $t = 3\pi/16$ s?

ft/s

In which direction is the mass heading at this instant?

- downward
- upward

(c) At what times does the mass pass through the equilibrium position?

, $n = 0, 1, 2, \ldots$

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5. Question Details ZillDiffEQ9 5.1.019. [3748685]

A model of a spring/mass system is $4x'' + e^{-0.1t}x = 0$. By inspection of the differential equation only, discuss the behavior of the system over a long period of time.

For large values of t the differential equation is approximated by $x'' = 0$. The solution of this equation is the linear function $x =$. Thus, for large time, the restoring force will have ---Select--- to the point where the spring is incapable of returning the mass, and the spring will simply ---Select---.

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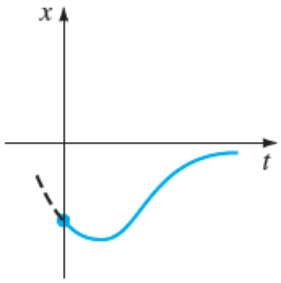
6. Question Details ZillDiffEQ9 5.1.021. [3748749]

The given figure represents the graph of an equation of motion for a damped spring/mass system. Use the graph to determine the following.



(a) whether the initial displacement is above or below the equilibrium position

- ◯ above
- ◯ below

(b) whether the mass is initially released from rest, heading downward, or heading upward

- ◯ from rest
- ◯ heading downward
- ◯ heading upward

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7. Question Details ZillDiffEQ9 5.1.025.MI.SA. [4605472]

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

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 6 ft/s. Determine the time at which the mass passes through the equilibrium position.

Find the time after the mass passes through the equilibrium position at which the mass attains its extreme displacement from the equilibrium position.

What is the position of the mass at this instant?

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8. Question Details ZillDiffEQ9 5.1.027. [3748759]

A 1-kilogram mass is attached to a spring whose constant is 16 N/m, and the entire system is then submerged in a liquid that imparts a damping force numerically equal to 10 times the instantaneous velocity. Determine the equations of motion if the following is true.

(a) the mass is initially released from rest from a point 1 meter below the equilibrium position

$x(t)$ = m

(b) the mass is initially released from a point 1 meter below the equilibrium position with an upward velocity of 13 m/s

$x(t)$ = m

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9. Question Details ZillDiffEQ9 5.1.029. [4568030]

A force of 2 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 0.8 times the instantaneous velocity.

(a) Find the equation of motion if the mass is initially released from rest from a point 1 foot above the equilibrium position.

$x(t)$ = ft

(b) Express the equation of motion in the form $x(t) = Ae^{-\lambda t}\sin\left(\sqrt{\omega^2 - \lambda^2}t + \varphi\right)$, which is given in (23) of Section 3.8. (Round φ to two decimal places.)

$x(t)$ = ft

(c) Find the first time at which the mass passes through the equilibrium position heading upward. (Round your answer to three decimal places.)

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Assignment Details

Name (AID): **Math 2C03 2021 Practice pb set #6 (18557225)**
Submissions Allowed: **20**
Category: **Homework**
Code:
Locked: **No**
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