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5. Practice

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Problem Set B due Aug 4, 2021 20:30 IST Completed

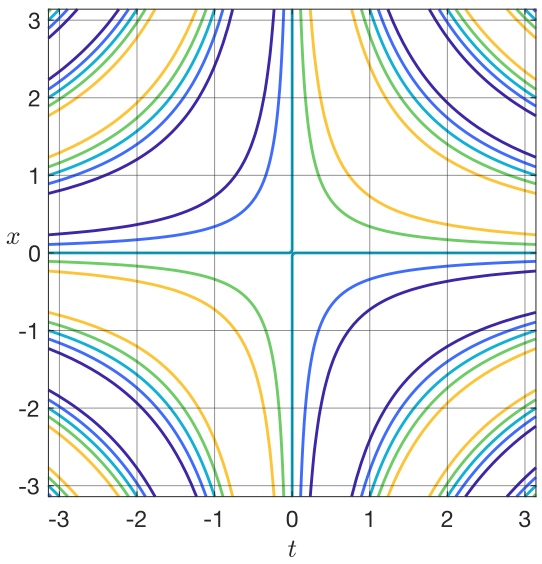
Practice

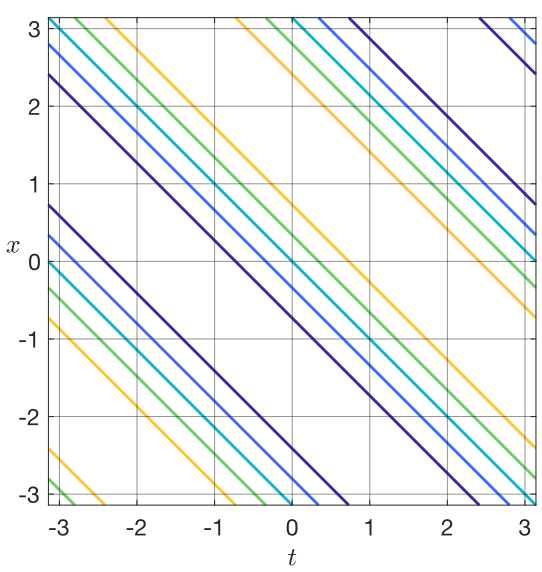
A second example, level curves

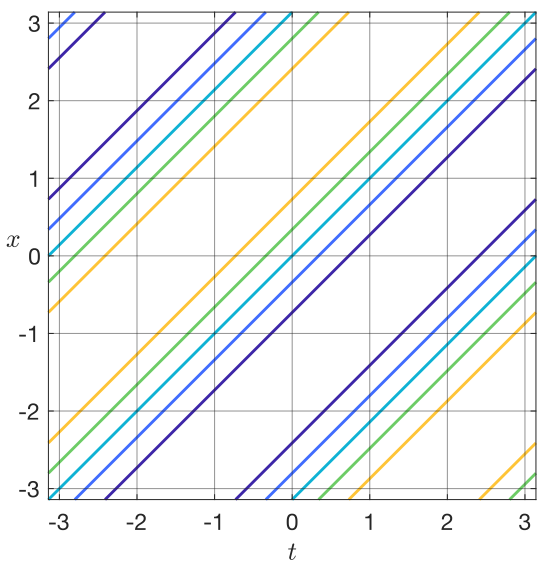
1/1 point (graded)

What are the level curves of the function $\sin(x+t)$?

Use the convention that the x axis is the vertical axis, and the t axis is the horizontal axis.







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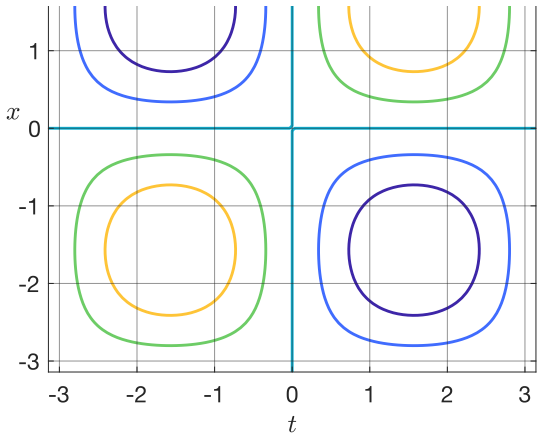

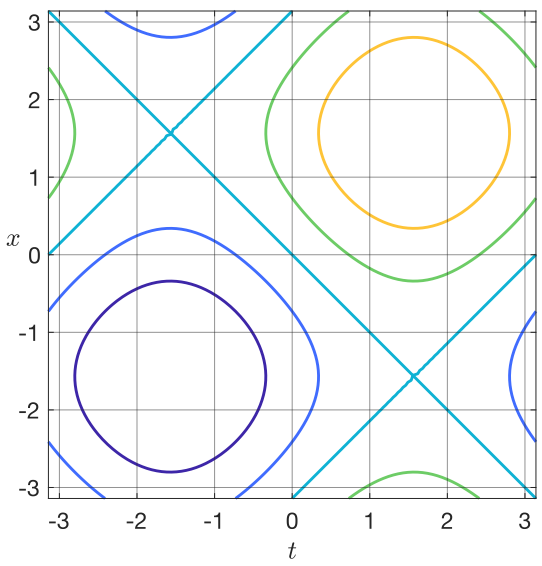

Solution:

To understand the level curves, it is helpful to look at specific levels and understand what is happening.

First let us consider the level curve $\sin(x+t)=0$ Note that this happens when $x+t=\pi k$ where k is any integer. Therefore the level curves for $\sin(x+t)=0$ is a collection of lines

$$\{t=\pi k-x | k \text{ an integer}\}$$

Note that these lines are all parallel to each other, with intercepts along the t axis differing by integer values of π.

We see that the level curves are very similar to the level curves for $\sin(x-t)$, except that the level curves are now lines parallel to $t=-x$ instead of $t=x$.

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

A second example, time perspective

1/1 point (graded)

What best describes how we observe the function $\sin(x+t)$ as a function that changes over time?

- A sine function that appears to travel to the right over time.
- A sine function that appears to travel to the left over time.
- A sine function whose frequency increases over time.
- A sine function whose frequency decreases over time.

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- A sine function whose amplitude increases over time.
- A since function whose amplitude decreases over time.

✔

Solution:

This is similar to the first example, except at every time t_0, the sine function is shifted to the left by t_0.

Submit You have used 1 of 5 attempts

Answers are displayed within the problem

A third example

1/1 point (graded)

What best describes how we observe the function $e^{-t}\sin(x)$ as a function that changes over time?

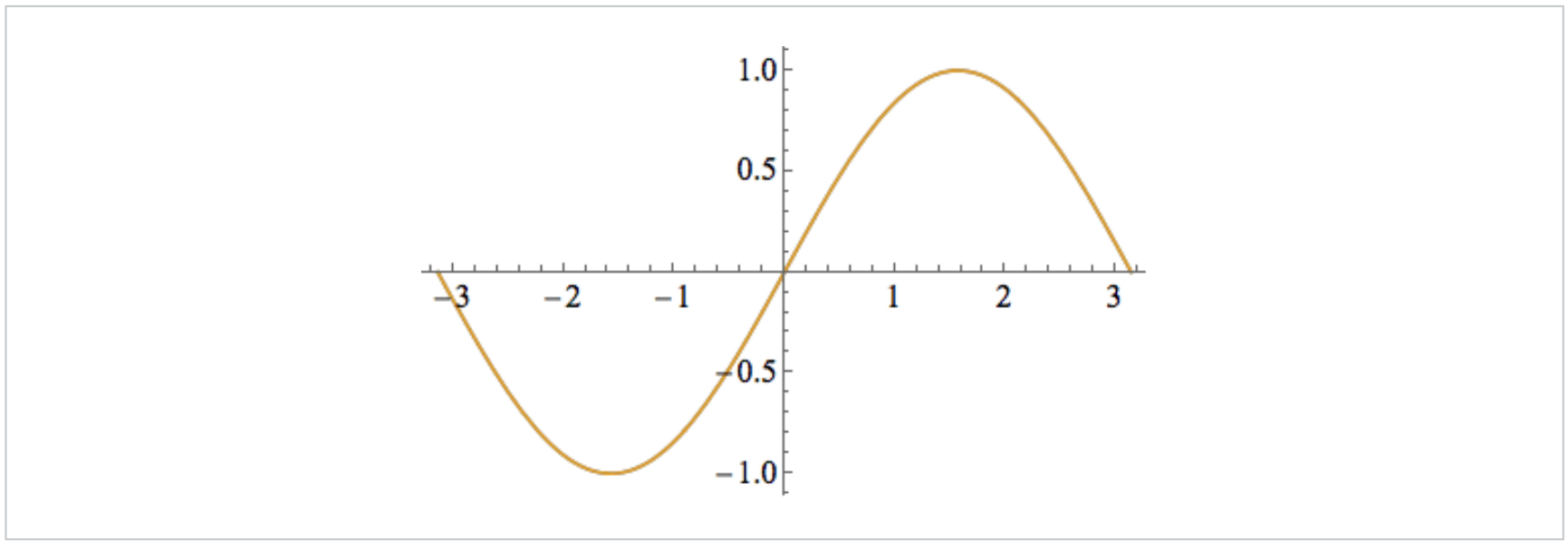
- A sine function that appears to travel to the right over time.
- A sine function that appears to travel to the left over time.
- A sine function whose frequency increases over time.
- A sine function whose frequency decreases over time.
- A sine function whose amplitude increases over time.
- A sine function whose amplitude decreases over time.

✔

Solution:

Note that at $t = 0$, we get the function $\sin(x)$. At a later time t, the function is $e^{-t}\sin(x)$. Therefore the amplitude of the sine function is being multiplied by a number $e^{-t} < 1$ for all $t > 0$. The larger t is, the smaller e^{-t} becomes. Therefore as t increases, the amplitude of the sine function is decreasing.

Below you see the function $\sin(x)$ in blue, and the function $e^{-t}\sin(x)$ animated over time in orange.



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Answers are displayed within the problem

5. Practice

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