Math 2C03 2021 Assignment #9 (18669919)

Due: Fri, Apr 2, 2021 11:00 PM EDT

Question 1 2 3 4 5 6 7 8 9 10

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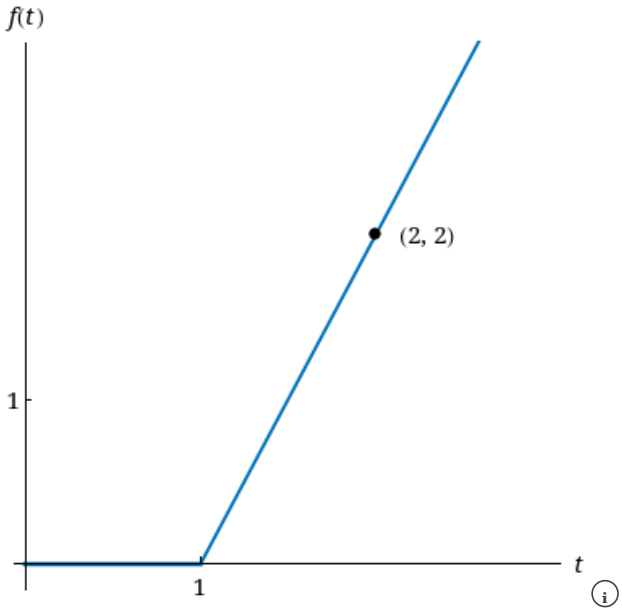
1. Question Details ZillDiffEQ9 7.1.008.MI.SA. [4605471]

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

Consider the following function.



Use Definition 7.1.1, to find $\mathscr{L}\{f(t)\}$.

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2. Question Details ZillDiffEQ9 7.1.038. [3897235]

Find $\mathscr{L}\{f(t)\}$ by first using a trigonometric identity. (Write your answer as a function of s.)

$$f(t) = \cos^2(t)$$

$\mathscr{L}\{f(t)\} =$

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3. Question Details ZillDiffEQ9 7.1.050. [3744680]

Under what conditions is a linear function $f(x) = mx + b$, $m \neq 0$, a linear transform? (Enter conditions as a comma-separated list of equations and inequalities. If there are no conditions under which the function is a linear transform, enter NONE.)

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4. Question Details ZillDiffEQ9 7.2.020. [4568154]

Use appropriate algebra and Theorem 7.2.1 to find the given inverse Laplace transform. (Write your answer as a function of t.)

$$\mathscr{L}^{-1}\left\{\frac{1}{s^2 + s - 12}\right\}$$

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5. Question Details ZillDiffEQ9 7.2.040.EP. [4603945]

Consider the following initial-value problem.

$$y'' - 3y' = 8e^{2t} - 2e^{-t}, \quad y(0) = 1, y'(0) = -1$$

Find $\mathscr{L}\{f(t)\}$, for $f(t) = 8e^{2t} - 2e^{-t}$. (Write your answer as a function of s.)

$\mathscr{L}(f(t)) =$

Use the Laplace transform to solve the given initial-value problem.

$y(t) =$

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6. Question Details ZillDiffEQ9 7.2.050. [3744669]

Make up two functions f_1 and f_2 that have the same Laplace transform. Do not think profound thoughts.

- $f_1(t) = 1$ and $f_2(t) = \begin{cases} 1, & t \geq 0, \quad t \neq 1 \\ 0, & t = 0 \end{cases}$
- $f_1(t) = 1$ and $f_2(t) = \begin{cases} 0, & t \geq 0, \quad t \neq 1 \\ 1, & t = 0 \end{cases}$
- $f_1(t) = 1$ and $f_2(t) = \begin{cases} 1, & 0 \leq t < 1 \\ 0, & 1 \leq t \end{cases}$
- $f_1(t) = 1$ and $f_2(t) = \begin{cases} 0, & 0 \leq t < 1 \\ 1, & 1 \leq t \end{cases}$
- $f_1(t) = 1$ and $f_2(t) = 0$

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7. Question Details ZillDiffEQ9 7.3.004. [3877285]

Find $F(s)$.

$$\mathscr{L}\{t^{10}e^{-9t}\}$$

$F(s) =$

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8. Question Details ZillDiffEQ9 7.3.016. [4568344]

Find $f(t)$.

$$\mathscr{L}^{-1}\left\{\frac{2s + 7}{s^2 + 8s + 65}\right\}$$

$f(t) =$

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9. Question Details ZillDiffEQ9 7.3.024. [3897245]

Use the Laplace transform to solve the given initial-value problem.

$$y'' - 4y' + 4y = t^3e^{2t},\ \ y(0) = 0,\ \ y'(0) = 0$$

$y(t) =$

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10. Question Details ZillDiffEQ9 7.4.018. [4568219]

Consider the differential equation

$$2y'' + ty' - 2y = 18, \quad y(0) = y'(0) = 0.$$

In some instances, the Laplace transform can be used to solve linear differential equations with variable monomial coefficients. Use Theorem 7.4.1.,

THEOREM 7.4.1 Derivatives of Transforms

If $F(s) = \mathcal{L}\{f(t)\}$ and $n = 1, 2, 3, \ldots$, then

$$\mathcal{L}\{t^nf(t)\} = (-1)^n\frac{d^n}{ds^n}F(s),$$

to reduce the given differential equation to a linear first-order DE in the transformed function $Y(s) = \mathcal{L}\{y(t)\}$.

Solve the first-order DE for $Y(s)$.

$Y(s) =$

Then find $y(t) = \mathcal{L}^{-1}\{Y(s)\}$.

$y(t) =$

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Assignment Details

Name (AID): **Math 2C03 2021 Assignment #9 (18669919)**
Submissions Allowed: **5**
Category: **Homework**
Code:
Locked: **Yes**
Author: **Lia Bronsard (** bronsard@mcmaster.ca **)**
Last Saved: **Mar 26, 2021 09:48 PM EDT**
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