Math 2C03 Last Assignment (18697914)

Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12

Description
Laplace Transforms

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1. Question Details ZillDiffEQ9 7.3.068.MI. [4568218]

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

$$y'' - 15y' + 56y = \mathcal{U}(t - 1), \quad y(0) = 0, y'(0) = 1$$

$y(t) =$ [ ] + ([ ])$\mathcal{U}$($t -$ [ ])

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2. Question Details ZillDiffEQ9 7.4.014.EP. [4903579]

Consider the following initial-value problem.

$$y'' + y = f(t), \quad y(0) = 1, \quad y'(0) = 0, \text{ where } f(t) = \begin{cases} 1, & 0 \le t < \frac{\pi}{2} \\ \sin(t), & t \ge \frac{\pi}{2} \end{cases}$$

Take the Laplace transform of the differential equation and solve for $\mathcal{L}\{y\}$. (Write your answer as a function of s.)

$\mathcal{L}\{y\} =$ [ ]

Use the Laplace transform to solve the given initial-value problem. Use the table of Laplace transforms as needed.

$y(t) =$ [ ] + ([ ])$\mathcal{U}$($t -$ [ ])

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3. Question Details ZillDiffEQ9 7.4.042.EP. [4903630]

Consider the following integral equation.

$$f(t) = 3t - 9\int_0^t \sin(\tau)\, f(t-\tau)\, d\tau$$

Take the Laplace transform of the integral equation and solve for $\mathscr{L}\{f\}$ (Write your answer as a function of s.)

$\mathscr{L}\{f\} =$

Solve the given integral equation.

$f(t) =$

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4. Question Details ZillDiffEQ9 7.4.046. [3897219]

Use the Laplace transform to solve the given integral equation.

$$f(t) = \cos(t) + \int_0^t e^{-\tau} f(t-\tau)\, d\tau$$

$f(t) =$

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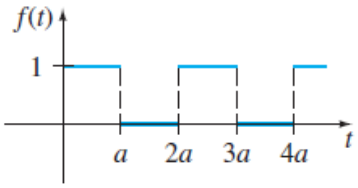
5. Question Details ZillDiffEQ9 7.4.054. [3897230]

Use Theorem 7.4.3 to find the Laplace transform $F(s)$ of the given periodic function.



square wave

$F(s) =$

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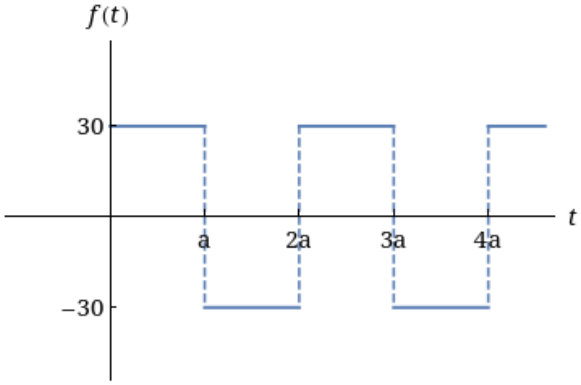
6. Question Details ZillDiffEQ9 7.4.061. [3745325]

Solve the model for a driven spring/mass system with damping

$$m\frac{d^2x}{dt^2} + \beta\frac{dx}{dt} + kx = f(t), \quad x(0) = 0, \quad x'(0) = 0,$$

where $m = 1/2$, $\beta = 1$, $k = 5$, and the driving function f is the meander function given below with amplitude 30, and $a = \pi$.



$x(t) = 6\left(\frac{1}{3} - e^{-t}\sin(3t) - \frac{1}{3}e^{-t}\cos(3t)\right) + 12$

$\sum_{n=1}^{\infty}(-1)^n\left[1 - e^{-(t-2n\pi)}\sin(3(t-2n\pi)) - \frac{1}{3}e^{-(t-2n\pi)}\cos(3(t-2n\pi))\right]\mathcal{U}(t-2n\pi)$

$x(t) = 6\left(1 - e^{-t}\cos(3t) - \frac{1}{3}e^{-t}\sin(3t)\right) + 12$

$\sum_{n=1}^{\infty}(-1)^n\left[1 - e^{-(t-n\pi)}\cos(3(t-n\pi)) - \frac{1}{3}e^{-(t-n\pi)}\sin(3(t-n\pi))\right]\mathcal{U}(t-n\pi)$

$x(t) = 6\left(1 - e^{-t}\cos(3t) - \frac{1}{3}e^{-t}\sin(3t)\right)$

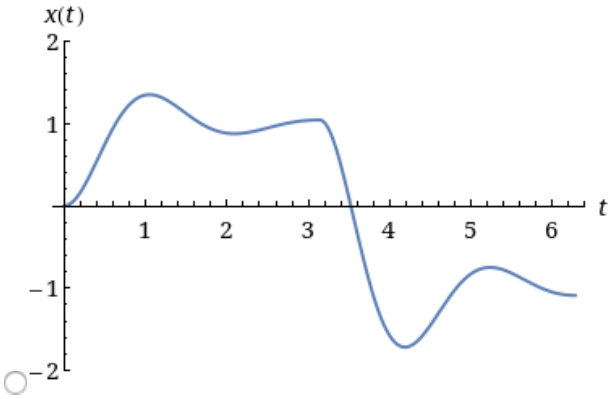
$x(t) = 6\left(1 - e^{-t}\cos(3t) - \frac{1}{3}e^{-t}\sin(3t)\right) + 12$

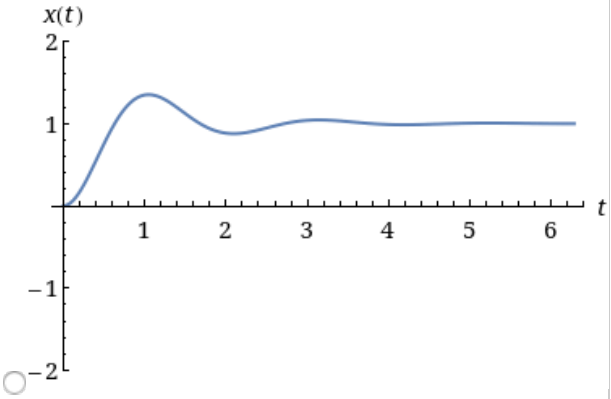
$\sum_{n=1}^{\infty}(-1)^n\left[1 - e^{-(t-2n\pi)}\cos(3(t-2n\pi)) - \frac{1}{3}e^{-(t-2n\pi)}\sin(3(t-2n\pi))\right]\mathcal{U}(t-2n\pi)$

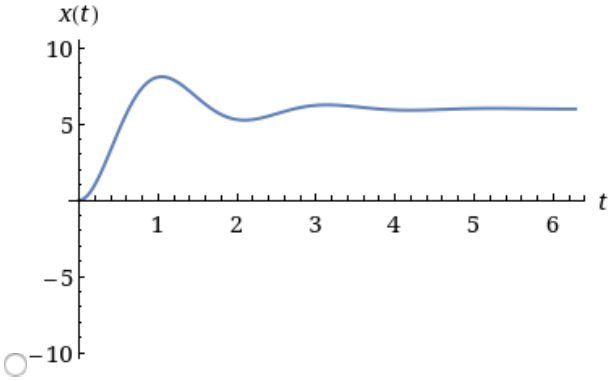
$x(t) = 6\left(\frac{1}{3} - e^{-t}\sin(3t) - \frac{1}{3}e^{-t}\cos(3t)\right) + 12$

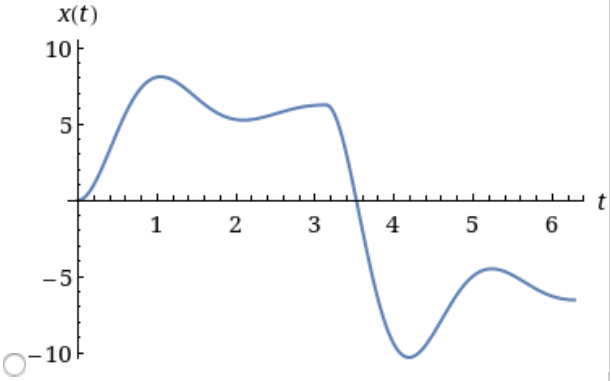
$\sum_{n=1}^{\infty}(-1)^n\left[1 - e^{-(t-n\pi)}\sin(3(t-n\pi)) - \frac{1}{3}e^{-(t-n\pi)}\cos(3(t-n\pi))\right]\mathcal{U}(t-n\pi)$

Use a graphing utility to graph $x(t)$ for $0 \le t < 2\pi$.









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7. Question Details ZillDiffEQ9 7.5.010. [4568262]

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

$$y'' + 2y' + y = \delta(t - 9),\ \ y(0) = 0,\ \ y'(0) = 0$$

$y(t) =$ [ ] + ([ ]) $\mathcal{U}(t -$ [ ])

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8. Question Details ZillDiffEQ9 7.5.012. [4567998]

Use the Laplace transform to solve the given differential equation subject to the indicated initial conditions.

$$y'' - 7y' + 6y = e^t + \delta(t - 3) + \delta(t - 7),\quad y(0) = 0,\ y'(0) = 0$$

$y(t) =$ ([ ]) + ([ ]) $\mathcal{U}(t - 3)$

+ ([ ]) $\mathcal{U}(t -$ [ ])

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9. Question Details ZillDiffEQ9 7.R.006. [3745130]

Answer true or false.

If $\mathcal{L}\{f(t)\} = F(s)$ and $\mathcal{L}\{g(t)\} = G(s)$, then $\mathcal{L}^{-1}\{F(s)G(s)\} = f(t)g(t)$.

- ○ True
- ○ False

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10. Question Details ZillDiffEQ9 7.R.022. [3745356]

Fill in the blank.

If $\mathscr{L}\{f(t)\} = F(s)$, then $\mathscr{L}\{te^{6t}f(t)\} =$ _____ .

- $-\frac{d}{ds}F(s-6)$
- $\frac{F(s-6)}{(s-6)^2}$
- $\frac{F(s)}{(s-6)^2}$
- $\frac{F(s)}{(s-6)}$
- $-\frac{d}{ds}sF(s-6)$

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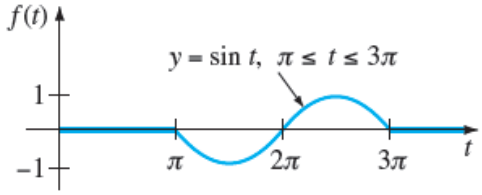
11. Question Details ZillDiffEQ9 7.R.030. [3745369]

Express f in terms of unit step functions.



- $f(t) = \sin(t+\pi)\mathscr{U}(t-\pi) - \sin(t+3\pi)\mathscr{U}(t-3\pi)$
- $f(t) = -\sin(t-\pi)\mathscr{U}(t-\pi) + \sin(t-3\pi)\mathscr{U}(t-3\pi)$
- $f(t) = \sin(t) - \sin(t)\mathscr{U}(t-\pi) + \sin(t)\mathscr{U}(t-3\pi)$
- $f(t) = \sin(t)\mathscr{U}(t-\pi) - \sin(t-3\pi)$
- $f(t) = \sin(t-\pi)\mathscr{U}(\pi-3\pi)$

Find $\mathscr{L}\{f(t)\}$ and $\mathscr{L}\{e^t f(t)\}$. (Enter your answer in terms of s.)

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

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

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12. Question Details ZillDiffEQ9 7.R.042. [3745339]

Use the Laplace transform to solve the given equation. (Enter your answers as a comma-separated list. Hint: There are two solutions to a square root.)

$$\int_0^t f(\tau)f(t-\tau)d\tau = 120t^5$$

$f(t) =$

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Assignment Details

Name (AID): **Math 2C03 Last Assignment (18697914)**
Submissions Allowed: **5**
Category: **Homework**
Code:
Locked: **Yes**
Author: **Lia Bronsard (** bronsard@mcmaster.ca **)**
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