Started on	Monday, 29 January 2024, 5:00 PM
State	Finished
Completed on	Monday, 29 January 2024, 5:34 PM
Time taken	34 mins 31 secs

Question **1**

Correct

Marked out of 2.00

Given the initial value problem: $x^2y'' + 3xy' + y = 0,\ x > 0 \quad y(1) = 4,\ \ y'(1) = 0$. Then $y(1) =$

Select one:

- $\frac{8}{e}$
- $-\frac{4}{e}$
- $\frac{1}{e}$
- 4 ✔
- $\frac{4}{e}$

The correct answer is: 4

Question **2**

Correct

Marked out of 2.00

The **inverse Laplace transform** $\mathcal{L}^{-1}\left\{\frac{s}{s^2-6s+10}\right\}$ equals

Select one:

- $e^{3t}\left(\cos t + 3\sin t\right)$ ✔
- $e^{-2t}\left(\cos 2t - \sin 2t\right)$
- $e^{2t}\left(\cos 2t - \sin 2t\right)$
- $e^{3t}\left(\cos t + \sin t\right)$
- $e^{-2t}\cos 2t$

The correct answer is: $e^{3t}\left(\cos t + 3\sin t\right)$

Question **3**

Correct

Marked out of 2.00

The Laplace transform of the solution of the IVP:
$f''(t) - f'(t) - f(t) = t,\ f(0) = f'(0) = 0$ satisfies:

Select one:

- $F(s) = \frac{1}{s(s^2+s+1)}$
- $F(s) = \frac{1}{s(s^2-s-1)}$
- $F(s) = \frac{1}{s(s^2+s-1)}$
- $F(s) = \frac{1}{s^2(s^2-s-1)}$ ✔
- $F(s) = \frac{1}{s(s^2-s+1)}$

The correct answer is: $F(s) = \frac{1}{s^2(s^2-s-1)}$

Question **4**

Correct

Marked out of 3.00

Use the table of Laplace transforms or the formula:

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

to determine the following expressions.

$\mathcal{L}\{t \sin 3t\}$

- $\frac{2s}{(s^2+1)^2}$
- $\frac{4s}{(s^2+4)^2}$
- $\frac{s^2-4}{(s^2+4)^2}$
- $\frac{s^2-1}{(s^2+1)^2}$
- $\frac{6s}{(s^2+9)^2}$ ✔
- $\frac{s^2-9}{(s^2+9)^2}$

The correct answer is: $\frac{6s}{(s^2+9)^2}$

$\mathcal{L}\{t^2 \sin 3t\}$

- $\frac{2s(s^2-27)}{(s^2+9)^3}$
- $\frac{2(3s^2-1)}{(s^2+1)^3}$
- $\frac{4(3s^2-4)}{(s^2+4)^3}$
- $\frac{2s(s^2-3)}{(s^2+1)^3}$
- $\frac{2s(s^2-12)}{(s^2+4)^3}$
- $\frac{18(s^2-3)}{(s^2+9)^3}$ ✔

The correct answer is: $\frac{18(s^2-3)}{(s^2+9)^3}$

Question **5**

Correct

Marked out of 3.00

Use the table of Laplace transforms or the formula:
$\mathcal{L}^{-1}\left\{\frac{d^n}{ds^n}\left(F(s)\right)\right\} = (-t)^n \mathcal{L}^{-1}\left\{F(s)\right\}$,
to determine the following expressions.
$\mathcal{L}^{-1}\left\{-\frac{8}{(s-5)(s+3)}\right\}$

- $2\ e^{-4t}\ \sinh(t)$
- $-2\ \sinh(2\ t)$
- $-2\ e^{t} \sinh(4\ t)$ ✔
- $-2\ e^{4t}\ \sinh(t)$
- $2\ e^{-t} \sinh(4\ t)$
- $-2\ \sinh(t)$

The correct answer is: $-2\ e^{t} \sinh(4\ t)$

$\mathcal{L}^{-1}\left\{\ln\left(\frac{s+3}{s-5}\right)\right\}$

- $\frac{2e^{t} \sinh(4\,t)}{t}$ ✔
- $-\frac{2e^{-4\,t}\ \sinh(t)}{t}$
- $-\frac{2e^{-t} \sinh(4\,t)}{t}$
- $\frac{2\ \sinh(t)}{t}$
- $\frac{2\ \sinh(2\,t)}{t}$
- $\frac{2e^{4\,t}\ \sinh(t)}{t}$

The correct answer is: $\frac{2e^{t} \sinh(4\,t)}{t}$