

Quiz 1415

1. (0) Find laplace transform of

$$u_2(t)(t^2 - 4t + 4)$$

2. (1) Find Inverse Laplace transform

$$\frac{3s + 4}{s^2 + 4s + 20}$$

3. (1) Find laplace transform of

$$e^{\pi t} \sin t + 2te^{3t}$$

4. (1) Find laplace transform of

$$u_{\pi} \sin t$$

5. (1) Rewrite the following piecewise continuous function $f(t)$ in terms of the unit-step functions, and then find its Laplace transform.

$$f(t) = \begin{cases} t & 0 \leq t < 2 \\ 2 & 2 \leq t \end{cases}$$

6. (2) Rewrite the following piecewise continuous function $f(t)$ in terms of the unit-step functions, and then find its Laplace transform.

$$f(t) = \begin{cases} 0 & 0 \leq t < 2 \\ 3t - 6 & 2 \leq t < 4 \\ 4e^{-3t} & 4 \leq t \end{cases}$$

7. (1) Use the Laplace transform to solve the IVP

$$y'' + 4y' + 8y = \delta(t - \pi), \quad y(0) = 0, y'(0) = -1$$

8. (1) Use the Laplace transform to solve the IVP

$$y'' + 2y' - 8y = e^{3t}u_3(t), \quad y(0) = 0, y'(0) = 1$$

9. (1) Use the Laplace transform to solve the IVP

$$y' + 3y = \delta(t - 1) + u_2(t), \quad y(0) = -4$$

10. (1) Find Inverse Laplace transform

$$\frac{e^{-3s}}{(s - 1)(s + 3)}$$

11. (2) Solve IVP for $x = (x_1, x_2)$

$$x' = \begin{pmatrix} -2 & 1 \\ 2 & -3 \end{pmatrix} x \\ x(0) = (4 \ 1)$$

What is $\lim_{t \rightarrow +\infty} |x(t)|$?

12. (1) Find the general solution of $x' = Ax$ with

$$A = \begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix}$$

Make a sketch for the phase portrait

13. (1) Determine the stability and the name associated with the equilibrium state $(0, 0)$ for the system $x' = Ax$ with

$$A = \begin{pmatrix} 3 & 1 \\ 0 & 3 \end{pmatrix}$$

and for different A

$$A = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$$

14. (1) Find the general solution of the system

$$x' = Ax$$

with

$$A = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$$

15. (2) Find the general solution of the system

$$x' = Ax$$

with

$$A = \begin{pmatrix} 2 & -5 \\ 1 & -2 \end{pmatrix}$$

Describe the type and stability of the eq. state $(0, 0)$

16. (2) Find the general solution of the system

$$x' = Ax$$

with

$$A = \begin{pmatrix} 1 & -2 \\ 3 & -4 \end{pmatrix}$$

Describe the type and stability of the eq. state $(0, 0)$