PRINTABLE VERSION

Quiz 9

You scored 35 out of 100

Question 1

Your answer is INCORRECT.

Give the general solution of the differential equation

$$y'' + 9y = 4\sec(3x)$$

a) $y = C_1 \sin(3x) + C_2 \cos(3x) + \frac{4}{3} x \sin(3x) + \frac{4}{9} \sin(3x) \ln(|\cos(3x)|)$

b) $y = C_1 e^{3x} + C_2 e^{-3x} + \frac{4}{3} x \sin(3x) - \frac{4}{9} \cos(3x) \ln(|\cos(3x)|)$

c) $y = C_1 \sin(3x) + C_2 \cos(3x) + \frac{4}{3} x \cos(3x) + \frac{4}{9} \cos(3x) \ln(|\cos(3x)|)$

d) $y = C_1 e^{3x} + C_2 e^{-3x} + \frac{4}{3} \sin(3x) + \frac{4}{9} \cos(3x) \ln(|\cos(3x)|)$

e) $y = C_1 e^{3x} + C_2 e^{-3x} + \frac{4}{3} \sin(3x) + \frac{4}{9} \sin(3x) \ln(|\cos(3x)|)$

f) None of the above.

Question 2

Your answer is INCORRECT.

Give the general solution of the differential equation

$$y'' + 16y = -5\cos(3x) - 2\sin(3x)$$

a) $y = C_1 \sin(4x) + C_2 \cos(4x) - \frac{2}{7} \cos(3x) + \frac{3}{7} x \sin(3x)$

b) $y = C_1 e^{4x} + C_2 e^{-4x} - \frac{5}{7} \cos(3x) - \frac{2}{7} \sin(3x)$

c) $y = C_1 e^{4x} + C_2 e^{-4x} - \frac{5}{7} \cos(3x) + \frac{2}{7} \sin(3x)$

d) $y = C_1 \sin(4x) + C_2 \cos(4x) - \frac{5}{7} \cos(3x) - \frac{2}{7} \sin(3x)$

e) $y = C_1 \sin(4x) + C_2 \cos(4x) - \frac{5}{7}\cos(3x) + \frac{2}{7}\sin(3x)$

f) None of the above.

Question 3

Your answer is CORRECT.

Give the general solution of the differential equation

$$y'' + 4y' + 5y = e^x \cos(2x)$$

a) $y = C_1 e^x \cos(2x) + C_2 e^x \sin(2x) - \frac{1}{30} e^x \cos(2x) - \frac{1}{15}\sin(2x)\, e^x$

b) $y = C_1 e^{-2x} \cos(x) + C_2 e^{-2x} \sin(x) - \frac{1}{30} e^x \cos(2x) - \frac{1}{15}\sin(2x)\, e^x$

c) $y = C_1 e^x \cos(2x) + C_2 e^x \sin(2x) + \frac{1}{30} e^x \cos(2x) + \frac{1}{15}\sin(2x)\, e^x$

d) $y = \frac{1}{30} e^x \cos(2x) + \frac{1}{15}\sin(2x)\, e^x + C_1 \cos(2x) + C_2 \sin(x)$

e) $y = C_1 e^{-2x} \cos(x) + C_2 e^{-2x} \sin(x) + \frac{1}{30} e^x \cos(2x) + \frac{1}{15}\sin(2x)\, e^x$

f) None of the above.

Question 4

Your answer is CORRECT.

Give the form of a particular solution of the differential equation

$$y'' - 2y' - 15y = -3\cos(2x) - 2e^{5x} + 3$$

a) $z = A\cos(2x) + B\sin(2x) + Ce^{5x} + Ex$

b) $z = A\cos(2x) + B\sin(2x) + Ce^{5x} + E$

c) $z = A\cos(2x) + Be^{5x} + C$

d) $z = A\cos(2x) + B\sin(2x) + Cxe^{5x} + E$

e) $z = A\cos(2x) + Bxe^{5x} + C$

f) None of the above.

Question 5

Your answer is INCORRECT.

Give the form of a particular solution of the differential equation

$$y'' + 6y' + 9y = e^{-5x}\sin(2x) + 2e^{-3x} - 3x$$

a) $z = Ae^{-5x}\sin(2x) + Ce^{-3x} + Ex + F$

b) $z = Ae^{-5x}\sin(2x) + Cx^2e^{-3x} + Ex$

c) $z = Ae^{-5x}\cos(2x) + Be^{-5x}\sin(2x) + Cx^2e^{-3x} + Ex + F$

d) $z = Ae^{-5x}\sin(2x) + Ce^{-3x} + Ex$

e) $z = Ae^{-5x}\cos(2x) + Be^{-5x}\sin(2x) + Cxe^{-3x} + Ex + F$

f) None of the above.

Question 6

Your answer is INCORRECT.

Find the general solution of

$$y^{(4)} + 4y''' + 12y'' - 4y' - 13y = 0$$

given that $r_1 = -2 + 3i$ is a root of the characteristic equation.

a) $y = C_1e^{x} + C_2e^{-x} + C_3e^{-2x}\cos(3x) + C_4e^{3x}\sin(-2x)$

b) $y = C_1e^{x} + C_2xe^{x} + C_3e^{-2x}\cos(3x) + C_4e^{-2x}\sin(3x)$

c) $y = C_1e^{-x} + C_2xe^{-x} + C_3e^{3x}\cos(-2x) + C_4e^{3x}\sin(-2x)$

d) $y = C_1e^{x} + C_2e^{-x} + C_3e^{-2x}\cos(3x) + C_4e^{-2x}\sin(3x)$

e) $y = C_1e^{x} + C_2e^{-x} + C_3e^{3x}\cos(-2x) + C_4e^{3x}\sin(-2x)$

f) None of the above.

Question 7

Your answer is INCORRECT.

Find the homogeneous equation with constant coefficients that has the given general solution

$$y = C_1 e^{2x} + C_2 x e^{2x} + C_3 e^{x} \cos(2x) + C_4 e^{x} \sin(2x)$$

a) $y^{(4)} + 2y''' + y'' + 12y' + 20y = 0$

b) $y^{(4)} - 2y''' + y'' - 2y' + y = 0$

c) $y''' - 2y'' + y' - 12y + 20 = 0$

d) $y^{(4)} + 6y''' + 9y'' - 4y' - 12y = 0$

e) $y^{(4)} - 6y''' + 17y'' - 28y' + 20y = 0$

f) None of the above.

Question 8

Your answer is CORRECT.

Find the general solution of the nonhomogeneous equation

$$y''' - 3y'' + 4y' - 12y = e^{x} + 3$$

a) $y = C_1 e^{-2x} + C_2 \cos(2x) + C_3 \sin(2x) + \frac{1}{4} + \frac{1}{10} e^{x}$

b) $y = C_1 e^{2x} + C_2 \cos(2x) + C_3 \sin(2x) - \frac{1}{2} - \frac{1}{5} e^{x}$

c) $y = C_1 e^{-3x} + C_2 \cos(2x) + C_3 \sin(2x) + \frac{1}{4} + \frac{1}{10} e^{x}$

d) $y = C_1 e^{3x} + C_2 \cos(2x) + C_3 \sin(2x) - \frac{1}{4} - \frac{1}{10} e^{x}$

e) $y = C_1 e^{-3x} + C_2 \cos(2x) + C_3 \sin(2x) - \frac{1}{4} - \frac{1}{10} e^{x}$

f) None of the above.

Question 9

Your answer is INCORRECT.

Give the Laplace transform for

$$f(x) = 3x\,e^{2x} + 4\,e^{-2x}\cos(5x)$$

a) $F(s) = \dfrac{6}{(s-2)^2} + \dfrac{4(s+2)}{(s+2)^2+25}$

b) $F(s) = \dfrac{3}{(s-2)^2} + \dfrac{4(s+2)}{(s+2)^2+25}$

c) $F(s) = \dfrac{3}{(s-2)^2} + \dfrac{20}{(s+2)^2+25}$

d) $F(s) = \dfrac{3}{(s-2)^2} + \dfrac{4(s+2)}{(s+2)^2+5}$

e) $F(s) = \dfrac{3}{s-2} + \dfrac{4(s+2)}{(s+2)^2+25}$

f) None of the above.

Question 10

Your answer is CORRECT.

Give the Laplace transform of the solution to

$$\left[y'' + 3y' + 16y = 4 + 4\,e^{-3x},\quad y(0) = -3,\quad y'(0) = -6\right]$$

a) $Y(s) = \dfrac{8}{(s+3)\left(s^2+3s+16\right)} + \dfrac{12}{s(s+3)\left(s^2+3s+16\right)} - \dfrac{3(s+3)}{s^2+3s+16} - \dfrac{6}{s^2+3s+16}$

b) $Y(s) = \dfrac{8}{(s+3)\left(s^2+3s+16\right)} + \dfrac{12}{s(s+3)\left(s^2+3s+16\right)} - \dfrac{3(s+3)}{s^2+3s+16} + \dfrac{6}{s^2+3s+16}$

c) $Y(s) = \dfrac{8}{(s+3)\left(s^2+3s+16\right)} + \dfrac{12}{s(s+3)\left(s^2+3s+16\right)} - \dfrac{15}{s^2+3s+16}$

d) $Y(s) = \dfrac{8}{(s+3)\left(s^2+3s+16\right)} + \dfrac{12}{s(s+3)\left(s^2+3s+16\right)} - \dfrac{3}{s^2+3s+16}$

e) $Y(s) = \dfrac{8}{(s+3)\left(s^2+3s+16\right)} + \dfrac{12}{s(s+3)\left(s^2+3s+16\right)} - \dfrac{3(s-3)}{s^2+3s+16} + \dfrac{6}{s^2+3s+16}$

f) None of the above.

Question 11

Your answer is CORRECT.

Find

$$\mathcal{L}^{-1}\left[\frac{-5s-4}{s^2+9}\right]$$

a) $-\frac{5}{3}\cos(3x)-\frac{4}{3}\sin(3x)$

b) $-\frac{4}{3}\cos(3x)-5\sin(3x)$

c) $-5\cos(3x)-\frac{4}{3}\sin(3x)$

d) $-5\cos(3x)-4\sin(3x)$

e) $-5e^{3x}-\frac{4}{3}xe^{3x}$

f) None of the above.

Question 12

Your answer is INCORRECT.

Give the inverse Laplace Transform of

$$F(s)=\frac{8s^2-10-s}{(s+3)(s^2+4)}$$

as a function of *t*.

a) $y(t)=\frac{5}{3}e^{3t}-3\cos(2t)+5\sin(2t)$

b) $y(t)=-5e^{3t}+3\cos(2t)-5\sin(2t)$

c) $y(t)=5e^{-3t}+3\cos(2t)-5\sin(2t)$

d) $y(t)=e^{-3t}-3\cos(2t)+5\sin(2t)$

e) $y(t)=10e^{-3t}-5\cos(2t)+3\sin(2t)$

f) None of the above.

Question 13

Your answer is CORRECT.

Use the Laplace transform to solve the initial-value problem:

$$\left[y'' + 5y' + 4y = 4e^{-5x},\quad y(0) = 5,\quad y'(0) = 2\right]$$

a) $y(x) = \frac{19}{3}e^{-x} + e^{-5x} - \frac{7}{3}e^{-4x}$

b) $y(x) = \frac{23}{3}e^{-x} + e^{-5x} - \frac{11}{3}e^{-4x}$

c) $y(x) = \frac{28}{3}e^{-x} + e^{-5x} - \frac{31}{3}e^{-4x}$

d) $y(x) = 8e^{-x} + e^{-5x} - 9e^{-4x}$

e) $y(x) = -\frac{31}{3}e^{-x} + e^{-5x} + \frac{43}{3}e^{-4x}$

f) None of the above.

Question 14

Your answer is INCORRECT.

Give the Laplace transform of

$$f(x) = \begin{cases} -3x^2 & 0 \le x \text{ and } x < 4 \\ 2 & 4 \le x \end{cases}$$

a) $F(s) = -\frac{6}{s^3} + e^{-4s}\left(\frac{6}{s^3} + \frac{24}{s^2} + \frac{50}{s}\right)$

b) $F(s) = -\frac{3}{s^3} + e^{-4s}\left(\frac{15}{s^3} - \frac{2}{s^2} + \frac{8}{s}\right)$

c) $F(s) = -\frac{2}{s^3} + e^{-4s}\left(-\frac{9}{s^3} + \frac{3}{s^2} + \frac{20}{s}\right)$

d) $F(s) = -\frac{1}{s^3} + e^{-4s}\left(\frac{5}{s^3} + \frac{1}{s^2} + \frac{20}{s}\right)$

e) $F(s) = -\frac{1}{s^3} + e^{-4s}\left(-\frac{3}{s^3} - \frac{1}{s^2} - \frac{18}{s}\right)$

f) None of the above.

Question 15

Your answer is INCORRECT.

Give the inverse Laplace transform of

$$F(s) = \frac{-3s + (s-3)\,e^{-\pi s}}{s^2 + 25}$$

as a function of x.
Note: The function u below is the unit step function, which is also known as the *Heaviside* function.

a) $f(x) = -3\sin(5x) - 2u(x-\pi)\cos(5x) + \frac{4}{5}u(x-\pi)\sin(5x)$

b) $f(x) = -3\cos(5x) - u(x-\pi)\cos(5x) + \frac{2}{5}u(x-\pi)\sin(5x)$

c) $f(x) = -3\cos(5x) - u(x-\pi)\cos(5x) + \frac{3}{5}u(x-\pi)\sin(5x)$

d) $f(x) = -3\sin(5x) - u(x-\pi)\cos(5x) + \frac{2}{5}u(x-\pi)\sin(5x)$

e) $f(x) = -3\,e^{5x} - u(x-\pi)\cos(5x) + u(x-\pi)\sin(5x)$

f) None of the above.

Question 16

Your answer is INCORRECT.

Determine if the following matrix is in reduced row echelon form. If not, give reasons why not.

$$\begin{bmatrix} 1 & -2 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -2 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

a) No, the first nonzero entry in row 2 is not 1.

b) Yes.

c) No, the leading 1 in the first row is not the only nonzero entry in its column.

d) No, the leading 1 in the third row is not the only nonzero entry in its column.

e) None of the above.

Question 17

Your answer is CORRECT.

Which of the following gives the correct matrix for this system of equations in reduced row echelon form?

$$\begin{bmatrix} x-3y-2z=2 \\ 4x-2y+2z=-3 \\ -x+2y+3z=-2 \end{bmatrix}$$

a) $\begin{bmatrix} 4 & 0 & 4 & 3 \\ 0 & 20 & 0 & -11 \\ 0 & 0 & 20 & 11 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 0 & 0 & -\frac{3}{4} \\ 0 & 1 & 0 & -\frac{11}{20} \\ 0 & 0 & 1 & \frac{11}{20} \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 & 0 & -\frac{3}{4} \\ 0 & 1 & 0 & -\frac{11}{20} \\ 0 & 0 & 1 & -\frac{11}{20} \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 & 0 & \frac{3}{4} \\ 0 & 1 & 0 & -\frac{11}{20} \\ 0 & 0 & 1 & -\frac{3}{4} \end{bmatrix}$

e) $\begin{bmatrix} 20 & 0 & 0 & -11 \\ 0 & 4 & 0 & -3 \\ 0 & 0 & 20 & -11 \end{bmatrix}$

f) None of the above.

Question 18

Your answer is INCORRECT.

Which of the following gives the correct matrix for this system of equations in reduced row echelon form?

$$\begin{bmatrix} x_1-2x_2-3x_3+2x_4=4 \\ -4x_2-x_3-2x_4=-4 \\ 3x_1-2x_2-2x_3-2x_4=3 \end{bmatrix}$$

a) $\begin{bmatrix} 1 & -2 & -3 & 2 & 4 \\ 0 & -4 & -1 & -2 & -4 \\ 0 & 0 & 6 & -10 & -13 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 0 & 0 & -\frac{5}{9} & \frac{49}{36} \\ 0 & 1 & 0 & \frac{11}{18} & \frac{83}{72} \\ 0 & 0 & 1 & -\frac{4}{9} & -\frac{11}{18} \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 & 0 & -\frac{7}{6} & \frac{7}{12} \\ 0 & 1 & 0 & \frac{11}{12} & \frac{37}{24} \\ 0 & 0 & 1 & -\frac{5}{3} & -\frac{13}{6} \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 & 0 & \frac{1}{9} & \frac{53}{18} \\ 0 & 1 & 0 & \frac{5}{18} & \frac{13}{36} \\ 0 & 0 & 1 & \frac{8}{9} & \frac{23}{9} \end{bmatrix}$

e) $\begin{bmatrix} -1 & -2 & 3 & 2 & 4 \\ 0 & -4 & -1 & -2 & -4 \\ 0 & 0 & 9 & 8 & 23 \end{bmatrix}$

f) None of the above.

Question 19

Your answer is INCORRECT.

Which of the following gives the correct matrix for this homogeneoussystem of equations in reduced row echelon form?

$$\begin{bmatrix} x_1 - 4x_2 + x_3 - 2x_4 = 0 \\ -2x_2 + 2x_4 = 0 \\ -3x_1 + 2x_2 + 4x_3 = 0 \end{bmatrix}$$

a) $\begin{bmatrix} -1 & -4 & -1 & -2 & 2 \\ 0 & -2 & 0 & 2 & 0 \\ 0 & 0 & 7 & 20 & -4 \end{bmatrix}$

b) $\begin{bmatrix} 1 & -4 & 1 & -2 & 0 \\ 0 & -2 & 0 & 2 & 0 \\ 0 & 0 & 7 & -16 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 & 0 & \frac{22}{7} & -\frac{10}{7} \\ 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 1 & \frac{20}{7} & -\frac{4}{7} \end{bmatrix}$

d) $\begin{bmatrix} 1 & 0 & 0 & -14 & 0 \\ 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 1 & -10 & 0 \end{bmatrix}$

e) $\begin{bmatrix} 1 & 0 & 0 & -\frac{26}{7} & 0 \\ 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 1 & -\frac{16}{7} & 0 \end{bmatrix}$

f) None of the above.

Question 20

Your answer is INCORRECT.

For what values of *a* does the system below have nontrivial solutions?

$$\begin{bmatrix} 3x+3y-2z=0 \\ -6x+ay+4z=0 \\ 2x+4y+4z=0 \end{bmatrix}$$

a) -4

b) 6

c) -2

d) 2

e) 3

f) None of the above.