# PRINTABLE VERSION

## Quiz 8

You scored 80 out of 100

**Question 1**

Your answer is CORRECT.

Give the Laplace transform of the solution to

$$[y' + 2y = 5e^{4x} - 3\sin(3x), \quad y(0) = 4]$$

**a)** $Y(s) = \frac{5}{(s+2)(s-4)} - \frac{9}{(s+2)(s^2+9)} + \frac{4}{s+2}$

**b)** $Y(s) = \frac{5}{(s-2)(s-4)} - \frac{9}{(s-2)(s^2+9)} + \frac{4}{s-2}$

**c)** $Y(s) = \frac{5}{(s+2)(s-4)} - \frac{9}{(s+2)(s^2+9)} - \frac{4}{s+2}$

**d)** $Y(s) = \frac{5}{s-4} - \frac{9}{s^2+9} + 4$

**e)** $Y(s) = \frac{5}{s-4} - \frac{9}{s^2+9} - \frac{4}{s-2}$

**f)** None of the above.

**Question 2**

Your answer is CORRECT.

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

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

**a)** $y(x) = -7e^{-4x} + \frac{5}{4}e^{-5x} + \frac{15}{4}e^{-x}$

**b)** $y(x) = e^{-4x} + \frac{5}{4}e^{-5x} - \frac{9}{4}e^{-x}$

**c)** $y(x) = \frac{7}{3}e^{-4x} + \frac{5}{4}e^{-5x} - \frac{43}{12}e^{-x}$

**d)** $y(x) = -\frac{5}{3}e^{-4x} + \frac{5}{4}e^{-5x} - \frac{19}{12}e^{-x}$

**e)** $y(x) = -\frac{1}{3}e^{-4x} + \frac{5}{4}e^{-5x} - \frac{35}{12}e^{-x}$

**f)** None of the above.

**Question 3**

Your answer is CORRECT.

Give the Laplace transform of

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

**a)** $F(s) = \frac{2}{s^2} - \frac{1}{s} + e^{-4s}\left(-\frac{9}{s} + \frac{2}{s^2}\right)$

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

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

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

**e)** $F(s) = -\frac{2}{s^2} + \frac{3}{s} + e^{-4s}\left(-\frac{9}{s} + \frac{1}{s^2}\right)$

**f)** None of the above.

**Question 4**

Your answer is CORRECT.

Give the Laplace transform of

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

**a)** $F(s) = \frac{3}{s^3} + e^{-3s}\left(-\frac{6}{s^3} - \frac{3}{s^2} - \frac{8}{s}\right)$

**b)** $F(s) = -\frac{2}{s^3} + e^{-3s}\left(-\frac{15}{s^3} + \frac{1}{s^2} - \frac{14}{s}\right)$

**c)** $F(s) = -\frac{3}{s^3} + e^{-3s}\left(-\frac{8}{s^3} - \frac{2}{s^2} + \frac{20}{s}\right)$

**d)** $F(s) = \frac{3}{s^3} + e^{-3s}\left(-\frac{8}{s^3} - \frac{2}{s^2} - \frac{20}{s}\right)$

**e)** $F(s) = -\frac{8}{s^3} + e^{-3s}\left(\frac{8}{s^3} + \frac{24}{s^2} + \frac{39}{s}\right)$

**f)** None of the above.

**Question 5**

Your answer is CORRECT.

Give the Laplace transform of

$$f(x) = \begin{cases} -2 & 0 \le x \text{ and } x < 4 \\ x & 4 \le x \text{ and } x < 6 \\ -4 & 6 \le x \end{cases}$$

**a)** $F(s) = \frac{9s - e^{-4s} + 9e^{-4s}s + e^{-6s} + 5e^{-6s}s}{s^2}$

**b)** $F(s) = -\frac{7s + e^{-4s} + 10e^{-4s}s + e^{-6s} + 5e^{-6s}s}{s^2}$

**c)** $F(s) = -\frac{-s + e^{-4s} + e^{-4s}s - e^{-6s} + 9e^{-6s}s}{s^2}$

**d)** $F(s) = -\frac{2s + e^{-6s} + 10e^{-6s}s - e^{-4s} - 6e^{-4s}s}{s^2}$

**e)** $F(s) = \frac{4s - e^{-4s} - 3e^{-4s}s + e^{-6s} + 3e^{-6s}s}{s^2}$

**f)** None of the above.

**Question 6**

Your answer is CORRECT.

Give the inverse Laplace transform of

$$F(s) = \frac{-4s - 2e^{-5s}}{s(s+2)}$$

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

**a)** $f(x) = -3e^{-2x} + u(x-5) - u(x-5)e^{-2x+10}$

**b)** $f(x) = 2e^{-2x} - \frac{5}{2}u(x-5) + \frac{5}{2}u(x-5)e^{-2x+10}$

**c)** $f(x) = -4e^{-2x} - u(x-5) + u(x-5)e^{-2x+10}$

**d)** $f(x) = 4e^{-2x} - \frac{3}{2}u(x-5) + \frac{3}{2}u(x-5)e^{-2x+10}$

**e)** $f(x) = -2e^{-2x} + 2u(x-5) - 2u(x-5)e^{-2x+10}$

**f)** None of the above.

**Question 7**

Your answer is CORRECT.

Give the inverse Laplace transform of

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

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

**a)** $f(x) = -4u(x-3)x - 3 - 3u(x-3)$

**b)** $f(x) = u(x-3)x - 3 + u(x-3)$

**c)** $f(x) = -u(x-3)x - 3 - 2u(x-3)$

**d)** $f(x) = 5u(x-3)x - 3 - 3u(x-3)$

**e)** $f(x) = 3u(x-3)x - 3 + 2u(x-3)$

**f)** None of the above.

**Question 8**

Your answer is CORRECT.

Give the inverse Laplace transform of

$$F(s) = \frac{-2s + (s-2)e^{-\pi s}}{s^2 + 9}$$

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

**a)** $f(x)=2\sin(3x)-u(x-\pi)\cos(3x)+u(x-\pi)\sin(3x)$

**b)** $f(x)=-2\cos(3x)-u(x-\pi)\cos(3x)+u(x-\pi)\sin(3x)$

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

**d)** $f(x)=2\sin(3x)+3u(x-\pi)\cos(3x)$

**e)** $f(x)=-2e^{-3x}+u(x-\pi)\cos(3x)+\frac{4}{3}u(x-\pi)\sin(3x)$

**f)** None of the above.

**Question 9**

Your answer is INCORRECT.

Use Laplace Transforms to solve the initial value problem

$$[y'+2y=f(x), y(0)=0]$$

where

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

**a)** $y(x)=\begin{cases}-2e^{-2x}+2 & 0\le x \text{ and } x<2\\ -2e^{-2x}+1+e^{4-2x} & 2\le x\end{cases}$

**b)** $y(x)=\begin{cases}2e^{-2x}-2 & 0\le x \text{ and } x<2\\ -2e^{-2x}+1+e^{4-2x} & 2\le x\end{cases}$

**c)** $y(x)=\begin{cases}2e^{-2x}-2 & 0\le x \text{ and } x<2\\ -2e^{-2x}+1-3e^{4-2x} & 2\le x\end{cases}$

**d)** $y(x)=\begin{cases}-2e^{-2x}-2 & 0\le x \text{ and } x<2\\ -2e^{-2x}+1-3e^{4-2x} & 2\le x\end{cases}$

**e)** $y(x)=\begin{cases}-2e^{-2x}+2 & 0\le x \text{ and } x<2\\ -2e^{-2x}-1+e^{4-2x} & 2\le x\end{cases}$

**f)** None of the above.

**Question 10**

Your answer is CORRECT.

Solve the system of equations.

$$\begin{bmatrix} 4x-2y=-2 \\ 3x+2y=5 \end{bmatrix}$$

**a)** *The system does not have a solution.*

**b)** $\left\{x=-\frac{3}{7}, y=\frac{13}{7}\right\}$

**c)** $\left\{x=-\frac{3}{7}, y=-\frac{13}{7}\right\}$

**d)** $\left\{x=\frac{13}{7}, y=-\frac{3}{7}\right\}$

**e)** $\left\{x=\frac{13}{7}, y=\frac{3}{7}\right\}$

**f)** None of the above.

**Question 11**

Your answer is CORRECT.

Solve the system of equations.

$$\begin{bmatrix} 2x+8y=-4 \\ -x-4y=2 \\ -\frac{1}{2}x-2y=1 \end{bmatrix}$$

**a)** *no solution*

**b)** $[x=-2, y=0]$

**c)** $\left[x=0, y=-\frac{1}{2}\right]$

**d)** $[x=-4a-2, y=a,$ *a is any real number*$]$

**e)** $[x=-4a+2, y=a,$ *a is any real number*$]$

**f)** None of the above.

**Question 12**

Your answer is CORRECT.

Solve the system of equations.

$$\begin{bmatrix} 2x-8y=-4 \\ x-4y=2 \\ -\frac{1}{2}x+2y=-1 \end{bmatrix}$$

**a)** $[x=2, y=0]$

**b)** $[x=4a-2, y=a,\ a \text{ is any real number}]$

**c)** *no solution*

**d)** $\left[x=0, y=-\frac{1}{2}\right]$

**e)** $[x=4a+2, y=a,\ a \text{ is any real number}]$

**f)** None of the above.

**Question 13**

Your answer is CORRECT.

The following matrix is the row echelon form of the augmented matrix of a system of linear equations. Find all solutions of the system.

$$\left[\begin{array}{ccc|c} 1 & -4 & -4 & -4 \\ 0 & 1 & -3 & -3 \\ 0 & 0 & 1 & -4 \end{array}\right]$$

**a)** $\{x=16, y=9, z=-4\}$

**b)** $\{x=-4, y=-3, z=-4\}$

**c)** $\{x=-64, y=-15, z=-4\}$

**d)** $\{x=-20, y=-15, z=-4\}$

**e)** *no solution*

**f)** None of the above.

**Question 14**

Your answer is CORRECT.

The following matrix is the row echelon form of the augmented matrix of a system of linear equations. Find all solutions of the system.

$$\left[\begin{array}{ccc|c} 1 & -4 & -4 & 4 \\ 0 & 1 & 4 & -4 \\ 0 & 0 & 0 & 0 \end{array}\right]$$

**a)** $\{x=-24, y=-8, z=1\}$

**b)** $\{x=-12-16a, y=-4+4a, z=a\}$, *a is any real number*

**c)** $\{x=-12, y=-4, z=0\}$

**d)** $\{x=-12-12a, y=-4-4a, z=a\}$, *a is any real number*

**e)** *no solution*

**f)** None of the above.

**Question 15**

Your answer is CORRECT.

Give the value of $y$ for the solution set to the system of equations

$$\left[\begin{array}{c} -2x+5y-2z=-2 \\ -3x+5y-2z=1 \\ -x+2y-z=-2 \end{array}\right]$$

**a)** $y=1$

**b)** $y=2$

**c)** $y=5$

**d)** $y=-1$

**e)** *The system does not have a solution.*

**f)** None of the above.

**Question 16**

Your answer is INCORRECT.

Give the solution set to the system of equations

$$\begin{bmatrix} 5x-3y+2z=-9 \\ -4x+2y-2z=6 \\ -2x+y-z=3 \end{bmatrix}$$

**a)** $[x=-2, y=-2s+1, z=1+2s]$

**b)** $[x=2s-2, y=-2s+1, z=3s+2]$

**c)** $[x=-2s+2, y=1+s, z=2]$

**d)** $[x=-2s-2, y=0, z=2s+3]$

**e)** *The system does not have a solution.*

**f)** None of the above.

**Question 17**

Your answer is CORRECT.

Give the solution set to the system of equations

$$\begin{bmatrix} -x-3y+2z=1 \\ -2x+2y-2z=-2 \\ x-y+z=-1 \end{bmatrix}$$

**a)** $\left[x=\frac{2}{3}-\frac{2}{3}s, y=4s-2, z=-\frac{4}{3}-\frac{5}{3}s\right]$

**b)** $\left[x=\frac{2}{3}-\frac{2}{3}s, y=3s-1, z=-\frac{4}{3}+\frac{10}{3}s\right]$

**c)** *The system does not have a solution.*

**d)** $\left[x=-\frac{1}{3}+\frac{7}{3}s, y=2s+1, z=-\frac{4}{3}+\frac{1}{3}s\right]$

**e)** $\left[x=\frac{11}{3}+\frac{10}{3}s, y=-2, z=\frac{8}{3}+\frac{1}{3}s\right]$

**f)** None of the above.

**Question 18**

Your answer is INCORRECT.

Give the solution set to the system of equations

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

**a)** $[x=-4+2s-4t, y=2s+t, z=3s+3t]$

**b)** $[x=-4+4s-4t, y=4s-3t, z=-t+s]$

**c)** $[x=-4-s-3t, y=4s+t, z=2t+3s]$

**d)** $[x=-4+3s, y=4s-2t, z=-2t+2s]$

**e)** *The system does not have a solution.*

**f)** None of the above.

**Question 19**

Your answer is INCORRECT.

Give the value of $k$ for which the system of equations below does not have a unique solution.

$$\begin{bmatrix} x+y+z=0 \\ 3x+y+(-2+k)z=8 \\ 2x+y-z=4 \end{bmatrix}$$

**a)** $k=-3$

**b)** $k=-1$

**c)** $k=-2$

**d)** $k=2$

**e)** $k=-4$

**f)** None of the above.

**Question 20**

Your answer is CORRECT.

Find the solution of the initial-value problem.

$$[y'''-2y''-y'+2y=0, y(0)=-6, y'(0)=1, y''(0)=-1]$$

HINT: $y(x) = e^x$ is a solution of the differential equation.

**a)** $y=-5e^{x}+\frac{8}{3}e^{-x}+\frac{5}{3}e^{2x}$

**b)** $y = -5e^{x} + \frac{5}{3}e^{-x} - \frac{8}{3}e^{2x}$

**c)** $y = 5e^{x} - \frac{8}{3}e^{-x} + \frac{5}{3}e^{2x}$

**d)** $y = -5e^{x} - \frac{8}{3}e^{-x} - \frac{5}{3}e^{2x}$

**e)** $y = -5e^{x} - \frac{8}{3}e^{-x} + \frac{5}{3}e^{2x}$

**f)** None of the above.