PRINTABLE VERSION

Quiz 4

You scored 90 out of 100

Question 1

Your answer is CORRECT.

There are functions of the form e^{rx} that solve the differential equation

$$y'' + 8y' + 15y = 0$$

Identify a fundamental set of solutions for this differential equation.

a) $\{e^{-5x}, e^{3x}\}$

b) $\{e^{-3x}, e^{5x}\}$

c) $\{e^{-5x}, e^{-3x}\}$

d) $\{e^{3x}, e^{5x}\}$

e) $\{x e^{-5x}, e^{-5x}\}$

f) None of the above.

Question 2

Your answer is CORRECT.

There are functions of the form x^r that solve the differential equation

$$x^2y'' - 7xy' + 15y = 0$$

Give the solution to the initial value problem

$$\left[x^2y'' - 7xy' + 15y = 0 \quad y(1) = 0 \quad y'(1) = 2 \right]$$

a) $y = x^5 - x^3$

b) $y = \frac{1}{2}x^3 - x^5$

c) $y = x^5 + \frac{1}{2}x^3$

d) $y = -x^3 + \frac{1}{2}x^5$

e) $y=-\frac{1}{2}x^5-x^3$

f) None of the above.

Question 3

Your answer is CORRECT.

Given the differential equation

$$y''-\left(\frac{3}{x}\right)y'-\left(\frac{5}{x^2}\right)y=0$$

Find two values of r such that $y = x^r$ is a solution of the equation.

a) $r=\{-1,5\}$

b) $r=\left\{-\frac{3}{2},2+\frac{1}{2}\sqrt{29}\right\}$

c) $r=\left\{2-\frac{1}{2}\sqrt{29},2+\frac{1}{2}\sqrt{29}\right\}$

d) $r=\left\{\frac{3}{2}-\frac{1}{2}\sqrt{29},\frac{3}{2}+\frac{1}{2}\sqrt{29}\right\}$

e) $r=\left\{2-\frac{1}{2}\sqrt{26},2+\frac{1}{2}\sqrt{26}\right\}$

f) None of the above.

Question 4

Your answer is INCORRECT.

Show that $y_1(x) = e^{6x}$ and $y_2(x) = e^{-5x}$ are linearly independent on $I = (-\infty, \infty)$ and find a second order homogeneous equation having the pair as a fundemental set of solutions.

a) $y''+6y'-5y=0$

b) $y''+y'-30y=0$

c) $y''-y'-30y=0$

d) $y''-10y'+5y=0$

e) $y''+y'+30y=0$

f) None of the above.

Question 5

Your answer is CORRECT.

Give the general solution to

$$y'' + 4y' + 8y = 0$$

a) $y = C_1 \cos(2x) - C_2 \sin(2x)$

b) $y = C_1 \cos(2x) + C_2 \sin(2x)$

c) $y = e^{2x}\left(C_1 \cos(2x) - C_2 \sin(2x)\right)$

d) $y = e^{-2x}\left(C_1 \cos(2x) + C_2 \sin(2x)\right)$

e) $y = C_1 e^{2x} + C_2 e^{2x}$

f) None of the above.

Question 6

Your answer is CORRECT.

Give the general solution to

$$y'' + 3y' + 2y = 0$$

a) $y = C_1 e^{-2x} + C_2 x e^{-2x}$

b) $y = C_1 e^{-2x} + C_2 e^{x}$

c) $y = C_1 e^{2x} + C_2 e^{x}$

d) $y = C_1 e^{-2x} + C_2 e^{-x}$

e) $y = C_1 e^{2x} + C_2 e^{-x}$

f) None of the above.

Question 7

Your answer is CORRECT.

Give the general solution to

$$y'' + 10y' + 25y = 0$$

a) $y = C_1 e^{-5x} + C_2 x e^{-5x}$

b) $y = C_1 e^{5x} + C_2 e^{-5x}$

c) $y = C_1 e^{5x} + C_2 x e^{5x}$

d) $y = C_1 e^{5x} + C_2 x e^{-5x}$

e) $y = C_1 e^{-5x} + C_2$

f) None of the above.

Question 8

Your answer is CORRECT.

The function

$$-3x e^{2x}$$

is a solution to a second order linear homogenous differential equation with constant coefficients. Give the differential equation.

a) $y'' - 4y' + 4y = 0$

b) $y'' + 6y' + 9y = 0$

c) $y'' + y' - 6y = 0$

d) $y'' + 4y' + 4y = 0$

e) $y'' - 6y' + 9y = 0$

f) None of the above.

Question 9

Your answer is CORRECT.

The function

$$-e^{4x}\cos(5x)$$

is a solution to a second order linear homogenous differential equation with constant coefficients. Give the differential equation.

a) $y'' + y' - 20y = 0$

b) $y'' + 10y' + 17y = 0$

c) $y''-8y'+41y=0$

d) $y''-8y'+25y=0$

e) $y''+8y'+25y=0$

f) None of the above.

Question 10

Your answer is CORRECT.

Find the solution of the initial value problem:

$$[y''-10y'+24y=0,\ y(0)=1,\ y'(0)=2]$$

a) $y=-e^{6x}+2e^{4x}$

b) $y=2e^{6x}-e^{4x}$

c) $y=-e^{6x}-2e^{4x}$

d) $y=e^{6x}-2e^{4x}$

e) $y=2e^{6x}+e^{4x}$

f) None of the above.

Question 11

Your answer is CORRECT.

Find the solution of the initial value problem:

$$[y''-y'-12y=0,\ y(0)=2,\ y'(0)=-3]$$

a) $y=\frac{11}{7}e^{4x}+\frac{3}{7}e^{-3x}$

b) $y=\frac{3}{7}e^{4x}+\frac{11}{7}e^{-3x}$

c) $y=\frac{3}{7}e^{4x}-\frac{11}{7}e^{-3x}$

d) $y=-\frac{3}{7}e^{4x}-\frac{11}{7}e^{-3x}$

e) $y = \frac{11}{7} e^{4x} - \frac{3}{7} e^{-3x}$

f) None of the above.

Question 12

Your answer is CORRECT.

Find the solution of the initial value problem:

$$[y'' - 8y' + 16y = 0,\ y(0) = -1,\ y'(0) = 2]$$

a) $y = 6e^{4x} - xe^{4x}$

b) $y = -e^{4x} + 6xe^{4x}$

c) $y = -e^{4x} - 12xe^{4x}$

d) $y = 2e^{4x} - 6xe^{4x}$

e) $y = 6e^{4x} + 2xe^{4x}$

f) None of the above.

Question 13

Your answer is CORRECT.

Find the solution of the initial value problem:

$$[y'' + 36y = 0,\ y(\pi) = 3,\ y'(\pi) = -1]$$

a) $y = -\frac{1}{6}\cos(6x) + 3\sin(6x)$

b) $y = 3e^{6x} - \frac{1}{6}xe^{6x}$

c) $y = 3\cos(6x) + \frac{1}{6}\sin(6x)$

d) $y = 3\cos(6x) - \frac{1}{6}\sin(6x)$

e) $y = -\frac{1}{6}e^{6x} + 3xe^{6x}$

f) None of the above.

Question 14

Your answer is CORRECT.

Find the solution of the initial value problem:

$$[y'' - 4y' + 13y = 0,\ y(0) = -3,\ y'(0) = -1]$$

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

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

c) $y = e^{3x}\left(-3\cos(2x) + \frac{5}{3}\sin(2x)\right)$

d) $y = \frac{5}{3}e^{2x} + 6xe^{3x}$

e) $y = e^{2x}\left(-3\cos(3x) + \frac{5}{3}\sin(3x)\right)$

f) None of the above.

Question 15

Your answer is CORRECT.

Find a differential equation

$$y'' + ay' + by = 0$$

that is satisfied by the given functions:

$$\left[y_1(x) = e^{-5x}\cos(6x),\ y_2(x) = e^{-5x}\sin(6x)\right]$$

a) $y'' + 36y' = 0$

b) $y'' + 12y' + 36y = 0$

c) $y'' + 36y = 0$

d) $y'' + 10y' + 61y = 0$

e) $y'' - 10y' + 61y = 0$

f) None of the above.

Question 16

Your answer is CORRECT.

Find a differential equation

$$y'' + ay' + by = 0$$

whose general solution is the given expression.

$$y = C_1 e^{\frac{1}{6}x} + C_2 x e^{\frac{1}{6}x}$$

a) $y'' + 36y = 0$

b) $y'' - 12y' + 36y = 0$

c) $y'' + 12y' + 36y = 0$

d) $y'' + 36y' = 0$

e) $y'' - \frac{1}{3}y' + \frac{1}{36}y = 0$

f) None of the above.

Question 17

Your answer is CORRECT.

Give the general solution of

$$xy' + 2y = \frac{3e^{-4x}}{x}$$

a) $y = -\frac{3}{4}\frac{e^{-4x}}{x^2} + \frac{C}{x^2}$

b) $y = -\frac{3}{4}e^{-4x} + C$

c) $y = -\frac{3}{4}x^2 e^{-4x} + Cx^2$

d) $y = \frac{3e^{-4x}}{x^2} + \frac{C}{x^2}$

e) $y = -\frac{3}{4}\frac{e^{-4x}}{x} + \frac{C}{x}$

f) None of the above.

Question 18

Your answer is CORRECT.

Give the general solution of

$$y' = \frac{y^2 - 2}{xy - 3y}$$

a) $y^2 = C(x-3) + 2$

b) $\ln(y^2 - 2) = x^2 - 6x + C$

c) $y^2 - 2 = Ce^{x-3}$

d) $y^2 = C(x-3)^2 + 2$

e) $y^2 - 2 = (x-3)^2 + C$

f) None of the above.

Question 19

Your answer is INCORRECT.

Give the general solution to

$$\frac{dy}{dx} = \frac{y^2 + 4x\sqrt{x^2+y^2}}{xy}$$

a) $\sqrt{1+y^2} = 4x^2\ln(x) + C$

b) $\sqrt{1+\frac{x^2}{y^2}} = 4C\ln(x)$

c) $\sqrt{1+\frac{y^2}{x^2}} = 4\ln(x) + C$

d) $\sqrt{1+y^2} = 4x^2\ln(x) + Cx^2$

e) $y^2 = 4\sqrt{1+x^2} + C$

f) None of the above.

Question 20

Your answer is CORRECT.

Give the general solution to

$$-3y' + \frac{2y}{x} = \frac{y^4}{x^4}$$

a) $\frac{1}{y^3} = -\frac{1}{2x^4} + \frac{C}{x^2}$

b) $y^4 = -\frac{1}{2x^3} + \frac{C}{x^2}$

c) $\frac{1}{y^3} = -\frac{1}{x^3} + \frac{C}{x^2}$

d) $y = -\frac{1}{x^4} + \frac{C}{x^2}$

e) $y = -\frac{1}{x^3} + \frac{C}{x^2}$

f) None of the above.