

1.)

The differential equation  $y' - \frac{y}{x} = \sqrt{\frac{x}{y}}$  is transformed into a separable differential equation using a suitable transformation. Which of the following differential equation is this new separable differential equation ?

A:

$$u' = \frac{1}{x\sqrt{u}}$$

B :

$$u' = \frac{1}{\sqrt{xu}}$$

C :

$$u' = x\sqrt{u}$$

D :

$$u' = \frac{1}{xu}$$

E :

$$u' = \sqrt{xu}$$

Doğru Cevap : A

2.)

Which of the following statement is true about the roots of the characteristic equation of the differential equation  $y''' + ay'' + by' = 0$  with  $a \in \mathbb{R}$ ,  $b < 0$  ?

A:

It has at least one pair of complex root.

B :

It has 2 coincident roots.

C :

It has 3 real and distinct roots.

D :

It has 1 real, 1 pair of complex roots.

E :

It has 3 coincident roots.

Doğru Cevap : C

3)

Which of the following is the differential equation that accepts the solution as the family of curves  $y = e^{c_1 \arctan x}$ , where  $c_1$  is a constant?

A:

$$y \ln y = (1 + x^2) y' \arctan x$$

B :

$$\frac{1}{y} \ln y = (1 + x^2) y' \arctan x$$

C :

$$\arctan x \cdot \ln y = (1 + x^2) y' y$$

D :

$$\ln y = (1 + x^2) y' \arctan x$$

E :

$$y \ln y = (1 + x^2) \arctan x$$

Doğru Cevap : A

4)

Let  $f(x^2)$  be a differentiable function. Which of the following function is the integrating factor  $\lambda = \lambda(x)$  of the differential equation  $dx + 2f(x^2)dy = 0$  ?

A:

$$f(x^2)$$

B :

$$\frac{1}{f(x^2)}$$

C :

$$f\left(\frac{1}{x^2}\right)$$

D :

$$\frac{1}{f\left(\frac{1}{x^2}\right)}$$

E :

None of them

Doğru Cevap : B

5)

For  $y' = p$ , which of the following statement is true ?

A:

The general solution of the differential equation  $y = xy' + (y')^3$  is  $y = cx + c^2$

B:

The differential equation  $y(y')^2 + x(y')^3 = 0$  is a Clairaut differential equation.

C:

The differential equation  $y = (2 + y')x + (y')^2$  transformed into a linear differential equation is  $\frac{dx}{dp} + \frac{x}{2} = -p$ .

D:

The differential equation  $yy' = -x(y')^2 + 4$  is a Clairaut differential equation.

E:

The general solution of the differential equation  $y - xy' - 3\sqrt{1 + (y')^3} = 0$  is  $y = cx + \sqrt{1 + c^3}$  dir.

Doğru Cevap : C

6)

Which of the following function is the integrating factor which transforms the differential equation

$$x \ln x \frac{dy}{dx} + y = 2 \ln x \text{ into an exact differential equation?}$$

A:

$$\ln(\ln x)$$

B :

$$x$$

C :

$$x^2$$

D :

$$\frac{1}{x}$$

E :

$$x \ln x$$

Doğru Cevap : D

7)

For which value of  $b$ , the differential equation  $(e^x \sin y + bx^2 y^2)dx + (e^x \cos y + x^3 y)dy = 0$  is an exact differential equation?

A:

$$2$$

B :

$$0$$

C :

$$\frac{1}{2}$$

D :

$$1$$

E :

$$\frac{3}{2}$$

Doğru Cevap : E

8)

Let  $y_1(t)$  and  $y_2(t)$  be two solutions of a second order homogeneous linear differential equation. The Wronskian determinant of the two solutions is  $W(y_1(t), y_2(t)) = e^{-t}$ . Then, which of the following statement is false?

A:

$y_1(t)$  and  $y_2(t)$  are linearly dependent functions.

B:

The function  $2y_1(t) - 3y_2(t)$  is also a solution of this differential equation.

C:

$y_1(t)$  and  $y_2(t)$  construct a fundamental set of solutions.

D:

All the solutions of this differential equation can be represented as  $c_1 y_1(t) + c_2 y_2(t)$ , where  $c_1$  and  $c_2$  are constants.

E:

$$W(2y_1(t), 3y_2(t)) = 6e^{-t}$$

Doğru Cevap : A

9)

Which of the following is true?

A:

$\sin(t) y'' + (1 - t^2)y' + \cos(y) y = 0$  is a second order linear differential equation.

B:

$y' = \frac{t}{y^2}$  is a first order linear differential equation.

C:

$y'' + (y')^3 + y = 0$  is a second order nonlinear differential equation.

D:

$y'' + y' + y = t$  is a second order homogeneous differential equation.

E:

$\frac{dy}{dt} + ty = 0$  is a nonlinear differential equation.

Doğru Cevap : C



10)

Which of the following is the differential equation that accepts the solution as the family of curves  $y = C_1x + C_2x \cdot \ln x$ , where  $C_1$  and  $C_2$  are constants?

A:

$$y'' - xy' - y = 0$$

B:

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

C:

$$x^2y'' + x^2y' + xy = 0$$

D:

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

E:

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

Doğru Cevap : B

11)

If  $x^2$ ,  $e^{2x} \cos x$  and  $e^{-3x}$  are some solutions of a sixth-order homogeneous differential equation with constant coefficient, then which of the following is the general solution of this differential equation ?

A:

$$y = c_0 + c_1x + c_2x^2 + c_3e^x \cos x + c_4e^{-3x}$$

B :

$$y = c_0 + c_1x + c_2x^2 + c_3x^3 + c_4e^x \sin x + c_5e^{-3x}$$

C :

$$y = c_0 + c_1x + c_2x^2 + e^{2x}(c_3 \sin x + c_4 \cos x) + c_5e^{-3x}$$

D :

$$y = c_0 + c_1x + c_2x^2 + c_3e^{2x} \cos x + c_4e^{-3x} + c_5xe^{-3x}$$

E :

$$y = c_0 + c_1x + c_2x^2 + c_3e^{2x} \sin x + c_4e^{-3x} + c_5xe^{-3x}$$

Doğru Cevap : C

12)

Which of the following transformation is the transformation that will convert the differential equation  $y' = \frac{2x-y+5}{x+y+1}$  into a homogeneous differential equation?

A:

$$x = x_1 - 2$$

$$y = y_1 + 1$$

B:

$$x = x_1 - 2$$

$$y = y_1 - 1$$

C:

$$x = x_1 + 2$$

$$y = y_1 - 1$$

D:

$$x = x_1 + 2$$

$$y = y_1 + 1$$

E:

$$x = x_1 + 1$$

$$y = y_1 + 2$$

Doğru Cevap : A

13)

For  $x \in \left[0, \frac{\pi}{2}\right]$ , What is the particular solution of the differential equation

$(y + y \sin x)y' = \sqrt{\cos^2 x - y^4 \cos^2 x}$  with the initial condition  $y(0) = 0$  ?

A:

$$\frac{1}{2} \operatorname{Arccos} y^2 = \ln(1 + \sin x)$$

B:

$$\frac{1}{2} \operatorname{Arcsin} y^2 = \ln(1 + \cos x)$$

C:

$$\frac{1}{2} \operatorname{Arcsin} y = \ln(1 + \cos x)$$

D:

$$\frac{1}{2} \operatorname{Arcsin} y^2 = \ln(1 + \sin x)$$

E:

$$\frac{1}{2} \operatorname{Arcsin} y^2 = \ln(1 - \sin x)$$

Doğru Cevap : D

14)

Which of the following functions construct a linearly independent function set?

A:

$$y_1 = e^{3x}, y_2 = 4e^{3x}, y_3 = e^{-x}$$

B:

$$y_1 = 3x^2 + 2, y_2 = x^2, y_3 = 1$$

C:

$$y_1 = e^{2x}, y_2 = e^{3x}, y_3 = e^{4x}$$

D:

$$y_1 = e^{2x}, y_2 = 2e^x, y_3 = e^{x+2}$$

E:

$$y_1 = e^{-x}, y_2 = 2e^x, y_3 = e^{x+2}$$

Doğru Cevap : C

15)

If  $y_1 = \frac{A}{x}$  is a particular solution of the differential equation  $y' + y^2 = \frac{2}{x^2}$ , then which of the following is the Bernoulli differential equation to be obtained for the largest value of  $A$ ?

A:

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

B:

$$u' - x^2u = -xu^2$$

C:

$$u' - \frac{4}{x}u = u^2$$

D:

$$u' + \frac{4}{x}u = u^2$$

E:

$$u' - 4xu = -u^2$$

Doğru Cevap : A

16)

A curve whose slope is  $\frac{C}{y\sqrt{1-x^2}}$  at any point passes from the points  $A(0,0)$  and  $B(1, \sqrt{\frac{\pi}{2}})$ . According to this information, What is the value of  $C$ ?

A:

$$\pi$$

B:

$$1$$

C:

$$\frac{1}{2}$$

D:

$$0$$

E:

$$\frac{\pi}{2}$$

Doğru Cevap : C

17)

If  $y = c_1 e^{5x} + c_2 x e^{5x}$  is the general solution of the differential equation  $y'' + ky' + my = 0$ , then what is the sum of  $k + m$ ?

A:

10

B :

15

C :

20

D :

0

E :

5

Doğru Cevap : B

1

18)

An algorithm that can learn by itself is to model a meteorite approaching the Earth with its sensors as  $Q''(x) - 3Q'(x) + 2Q(x) = 0$ ,  $Q(0) = 1$ ,  $Q'(0) = 2$ . So, what does the algorithm find the function  $Q(x)$ ?

A:

$2e^{2x}$

B :

$4e^{2x}$

C :

0

D :

$e^x$

E :

$e^{2x}$

Doğru Cevap : E

19)

Which of the following is the linear differential equation that is transformed from the differential equation  $y = -x(y')^3 + \ln(1 + (y')) + 5$  and the integrating factor which obtained from this linear differential equation?

A:

$$\frac{dx}{dp} + \frac{3p}{(1+p^2)} x = \frac{1}{p(1+p)(1+p^2)}; \quad \mu = (1+p^2)^{\frac{5}{2}}$$

B:

$$\frac{dx}{dp} + \frac{5p}{(1+p^2)} x = \frac{1}{p(1+p)(1+p^2)}; \quad \mu = (1+p^2)^{\frac{5}{2}}$$

C:

$$\frac{dx}{dp} + \frac{5p}{(1+p^2)} x = \frac{1}{p(1+p)(1+p^2)}; \quad \mu = (1+p^2)^{\frac{5}{4}}$$

D:

$$\frac{dx}{dp} + \frac{3p}{(1+p^2)} x = \frac{1}{p(1+p)(1+p^2)}; \quad \mu = (1+p^2)^{\frac{3}{2}}$$

E:

$$\frac{dx}{dp} + \frac{2p}{3(1+p^2)} x = \frac{1}{(1+p)(1+p^2)}; \quad \mu = (1+p^2)^{\frac{1}{3}}$$

Doğru Cevap : D

Which of the following differential equation is the new form of the  $y' = 6y + 3x(\sqrt[3]{y})$  differential equation transformed into a linear differential equation using a suitable transformation?

A:

$$\frac{dz}{dx} - z = x^3$$

B :

$$\frac{dz}{dx} - 4z = 2x$$

C :

$$\frac{dz}{dx} - 9z = \frac{9x}{2}$$

D :

$$\frac{dz}{dx} - \frac{3z}{2} = 6x$$

E :

$$\frac{dz}{dx} - 6z = \sqrt[3]{x}$$

Doğru Cevap : B