Which of the following is the general solution of $y' + 4y = 0$ at $x = 0$ using the power series?

A) ~~$y = a_0(1 + 2x + 3x^2 + 4x^3 + \cdots)$~~

B) $y = a_0(1 - 4x + 2x^2 + 8x^3 + \cdots)$

C) $y = a_0(1 - 4x + 8x^2 - \frac{32}{3}x^3 + \cdots)$

D) ~~$y = a_0(1 - 4x + \frac{1}{4}x^2 - \frac{3}{2}x^3 + \cdots)$~~

E) ~~$y = a_0(1 + 4x - 3x^2 - 6x^3 + \cdots)$~~

Which of the following is the recurrence relation of $y'' - 4y' = 0$ at $x = 4$ using the power series?

A) $a_{n+1} = 4\frac{a_{n-1}}{n}$ $(n \geq 1)$

B) $a_{n+1} = 4\frac{a_n}{(n+1)}$ $(n \geq 1)$

C) $a_{n+2} = 4\frac{a_n}{(n+2)}$ $(n \geq 2)$

D) $a_{n+2} = 4\frac{a_{n+1}}{n}$ $(n \geq 1)$

E) $a_{n+1} = \frac{a_n}{(n+2)}$ $(n \geq 1)$

The differential equation $x^3y''' - 2x^2y'' - 4xy' + 8y = x^2 + lnx$ is transformed into a differential equation with constant coefficients using a suitable transformation. Which of the following is the new differential equation?

A) ~~$\frac{d^3y}{dt^3} - 5\frac{d^2y}{dt^2} + 8\frac{dy}{dt} = e^t + 2t$~~

B) ~~$\frac{d^3y}{dt^3} - \frac{d^2y}{dt^2} - 8y = e^t + 2t$~~

C) $\frac{d^3y}{dt^3} - 5\frac{d^2y}{dt^2} + 8y = e^{2t} + t$

D) $\frac{d^3y}{dt^3} + \frac{d^2y}{dt^2} - 8\frac{dy}{dt} = e^{2t} + t$

E) ~~$\frac{d^3y}{dt^3} + 5\frac{d^2y}{dt^2} + 18y = e^{2t} - t$~~

If the two independent solutions of a fourth-order, homogeneous(non-second sided), linear differential equation are 1 and x^2e^{-x}, then which of the following is this differential equation?

A) $y^{(4)} + 3y''' + 3y'' + y' = 0$

B) $y^{(4)} - 3y'' - 2y' = 0$

C) $y^{(4)} + 3y''' - 2y' = 0$

D) $y^{(4)} - 3y''' + 3y'' - y' = 0$

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

Which of the following is the general solution of $y^{(6)} + 4y^{(4)} + 3y'' = 0$?

a) $y = c_1 + c_2x + c_3x\cos x + c_4\sin x + c_5x\cos\sqrt{3}x + c_6\sin\sqrt{3}x$

b) $y = c_1 + c_2x + c_3\cos x + c_4x\sin x + c_5\cos\sqrt{3}x + c_6x\sin\sqrt{3}x$

c) $y = c_1 + c_2x + c_3\cos x + c_4\sin x + c_5\cos\sqrt{3}x + c_6\sin\sqrt{3}x$

d) $y = c_1 + c_2x + c_3\cos 2x + c_4\sin 2x + c_5\cos\sqrt{3}x + c_6\sin\sqrt{3}x$

e) $y = c_1 + c_2x + c_3x\cos x + c_4x\sin x + c_5\cos\sqrt{3}x + c_6\sin\sqrt{3}x$

The solutions of the homogeneous(non-second handed) part of a differential equation with constant coefficients are given as $\sin x$, $cosx$ and 1. If the right side of this differential equation is $f(x) = 5x + e^{-x} - 2\sin x$, then which of the following gives the particular solution form of this equation?

A) $y_o \cancel{= (ax+b) + Ae^{-x} + x}(C\sin x + D\cos x)$

B) $y_o = (ax+b)x + Ae^{-x} + x(C\sin x + D\cos x)$

C) $y_o = (ax+b)x + Axe^{x} + C\sin x + D\cos x$

D) $y_o \cancel{= (ax+b)x^2} + Ae^{x} + x(C\sin x + D\cos x)$

E) $y_o = (ax+b)x + Ae^{-x} + x^2(C\sin x + D\cos x)$

Which of the following is the solution form of the right-sided (non-homogeneous) of the differential equation $y''' - 2y'' + 2y' = e^{x}cosx + xsin3x$?

A) $y_ö = xe^{x}(Asinx + Bcosx) + (Cx + D)sin3x + (Ex + F)cos3x$

B) $y_ö = \cancel{e^{x}}(Asinx + Bcosx) + (Cx + D)sin3x + (Ex + F)cos3x$

C) $y_ö = \cancel{x^2}e^{x}(Asinx + Bcosx) + x[(Cx + D)sin3x + (Ex + F)cos3x]$

D) $y_ö = xe^{x}(Asinx + Bcosx) + x[(Cx + D)sin3x + (Ex + F)cos3x]$

E) $y_ö = \cancel{e^{x}}(Asinx + Bcosx) + x[(Cx + D)sin3x + (Ex + F)cos3x]$

Which of the following is the solution of the initial value problem $y''' - y'' - 6y' = 0$, $y(0) = 5,\ y'(0) = 0,\ y''(0) = 30$?

A) $y(x) = 3e^{2x} + 2e^{-3x}$

B) $y(x) = 3e^{-2x} + 2e^{3x}$

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

~~D) $y(x) = 3e^{-2x} - 2e^{3x}$~~

~~E) $y(x) = -2e^{-2x} + 3e^{3x}$~~

Which of the following is the general solution of $3y^2y'' - 6y\,(y'\,)^2 = 0$?

A) $y = c_1x^2 + c_2x$

B) $y = \frac{1}{c_1x^2 - c_2}$

C) $y = -\frac{1}{c_1x + c_2}$

D) $y = (c_1x + c_2)$

E) $y = c_1x^2 + c_2$

The differential equation $xy'' = (y')^2 Inx - y'$, $(x > 0)$ is transformed into a linear differential equation using a suitable transformation. Then which of the following is the new differential equation?

A) $z' - e^x z = 1$

B) $z' + \frac{1}{x} z = e^x$

C) $z' + Inx\, z = x$

D) $z' + \frac{1}{x} z = \frac{Inx}{x} z^2$

E) $z' - \frac{1}{x} z = -\frac{Inx}{x}$

When the general solution of $y'' + 4y = tan2x$ is written as $y = U(x)cos2x + V(x)sin2x$, then which of the following is V' ?

A) $V' = \frac{-1}{2} cos2x$ B) $V' = \frac{1}{2} sin2x$

C) $V' = \frac{-1}{4} cos2x$ D) $V' = \frac{-1}{2} sin2x$

E) $V' = 2sin2x$

Which of the following system is used for the solution of the differential equation

$6y'' - y' - 12y = Arcsinx$?

A) $c_1' e^{\frac{3}{2}x} + c_2' e^{\frac{-4}{3}x} = 0$ ve $\frac{3}{2} c_1' e^{\frac{3}{2}x} - \frac{4}{3} c_2' e^{\frac{-4}{3}x} = Arcsinx$

B) $c_1' e^{\frac{3}{2}x} + c_2' e^{\frac{-4}{3}x} = 0$ ve $\frac{3}{2} c_1' e^{\frac{3}{2}x} - \frac{4}{3} c_2' e^{\frac{-4}{3}x} = \frac{1}{6} Arcsinx$

C) $c_1' e^{\frac{3}{2}x} + c_2' e^{\frac{-4}{3}x} = 0$ ve $\frac{3}{2} c_1' e^{\frac{3}{2}x} + \frac{4}{3} c_2' e^{\frac{-4}{3}x} = Arcsinx$

D) $c_1' e^{\frac{3}{2}x} + c_2' e^{\frac{-4}{3}x} = 0$ ve $\frac{3}{12} c_1' e^{\frac{3}{2}x} - \frac{4}{18} c_2' e^{\frac{-4}{3}x} = \frac{1}{6} Arcsinx$

E) $\frac{3}{2} c_1' e^{\frac{3}{2}x} - \frac{4}{3} c_2' e^{\frac{-4}{3}x} = 0$ ve $\frac{9}{4} c_1' e^{\frac{3}{2}x} + \frac{16}{9} c_2' e^{\frac{-4}{3}x} = Arcsinx$

If the general solution of $y'' + ay' + by = 0$ is $y = e^{-x}(c_1 \sin 2x + c_2 \cos 2x)$, then what is the sum $a + b$?

A) 2 B) 5 C) 7 D)8 E)10

The differential equation $y'' + 3y' + 2y = xe^{-x}$ is given. Then, which of the following is the reduced form of this differential equation?

A) $u'' - u' = x$ B) $u'' + u = x$ C) $u'' + u' = x$ D) $u'' - u = x$

E) $u'' + 2u' = x$

Which of the following is the coefficient of x^3 which appears in the power series $\sum_{n=0}^{\infty} a_n x^n$ of the differential equation $x\frac{d^2y}{dx^2} + y = 0$?

A) $\frac{2a_1}{5}$ B) $\frac{a_1}{12}$ C) $\frac{a_1 - a_0}{7}$ D) $\frac{-a_0}{6}$ E) $\frac{-a_0}{12}$

Which of the following can NOT be the linearly independent solutions of the differential equation $y'' = 0$?

a) $\{5,\ 3x\}$
b) $\{5+2x,\ 3x\}$
c) $\{2,\ 3x^2\}$
d) $\{5-x,\ 3\}$
e) $\{5x-1,\ 2x\}$

The differential equation $y^3y'' = y^2y' + 2y(y')^2$ is transformed into a first order differential equation using a suitable transformation. Then, which of the following is the new form of this differential equation?

A) $yp' - p(y^2 - 2p) = 0$

B) $p(\,y^2 \frac{dp}{dy} - y - 2p) = 0$

C) $yp' - p(y^2 + 2py) = 0$

D) $p(\frac{dp}{dy} - y^2 - 2p) = 0$

E) $yp' + p(2y^2 - p) = 0$

When the general solution of $y''' + y' = \frac{1}{sin^3x}$ is searched as the form of

$y = c_1(x) + c_2(x)cosx + c_3(x)sinx$ according to *Variation of Parameters Method*, then which of the following is the $c_3(x)$ function?

a) $c_3(x) = cotx + k$

b) $c_3(x) = tanx + k$

c) $c_3(x) = secx + k$

d) $c_3(x) = cosecx + k$

e) $c_3(x) = cosx + k$

$x^2y'' + kxy' + y = \frac{1}{x}lnx$, $(x > 0, k \in \mathbb{R})$ is transformed into a differential equation with constant coefficients. If the particular (nonhomogeneous) solution form of this new equation is $y_ö = (at + b)t^2e^{-t}$, then what is the value of k ?

a) 0 b) 1 c) 2 d) 3 e) -1

The differential equation $(1+y')\sin(x+y) = y'$ is transformed into a seperable differential equation using a suitable transformation. Which of the following is the new differential equation?

A) $u' = \frac{1}{1-sinu}$

B) $u' = \frac{1}{1+sinu}$

C) $u' = \frac{1}{1-cosu}$

D) $u' = \frac{1}{1+cosu}$

E) $u' = \frac{1}{1-sin^2u}$

SORU 3. $y'' + Ky' + 4y = x^2e^x$ $\quad y(0) = y'(0) = 0$ başlangıç değer probleminin çözümü $y = e^x(x^2+4x+6) + 2(x-3)e^{2x}$ ise K sayısı kaçtır?

a) 4
b) 2
c) -4
d) -2
e) 0 CEVAP C

SORU 4. $x^2y'' - (y')^2 + 3xy' = 0$ Diferansiyel denklemi için uygun değişken dönüşümü yapılarak elde edilen lineer diferansiyel denklem aşağıdakilerden hangisidir?

a) $z' - 3\frac{z}{x} = -\frac{1}{x^2}$

b) $2z' + zx = 4$

c) $z' + \frac{z}{x} = 4$

d) $2z' + 4zx = 2$

e) $z' + z = x$

SORU 6. Cauchy-Euler diferansiyel denklemi olduğu bilinen $x^k y'' + xy' + y = kx+1$

diferansiyel denklemi, uygun bir değişken dönüşümü ile aşağıdaki hangi sabit katsayılı denkleme dönüşür?

a) $\frac{d^2y}{dt^2} + y = 2e^t + 1$

b) $\frac{d^2y}{dt^2} + \frac{dy}{dt} - y = 2t + 1$

c) $\frac{d^2y}{dt^2} + y = 2e^t + 1$

d) $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - y = e^{2t} + e^t$

e) $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - y = t + 1$ (Cevap a)

SORU 7. $y'' - 4y = lnx^4$ diferansiyel denkleminin genel çözümü $y = f(x)e^{3x} + g(x)e^{-3x}$ şeklinde yazılıyor. Buna göre $2f(x)'e^{3x} - g(x)'e^{-3x}$ aşağıdakilerden hangisidir?

a) lnx

b) $2lnx$

c) 0

d) $\frac{2lnx}{e^{3x}}$

e) $4lnx$ Cevap b) 2lnx

SORU 10. $\boldsymbol{y = xy' + Cos(y')}$ diferansiyel denkleminin tekil çözümü aşağıdakilerden hangisidir?

a) $\boldsymbol{y = xArcsinx + \sqrt{1 - x^2}}$

b) $\boldsymbol{y = xArcsinx - \sqrt{1 - x^2}}$

c) $\boldsymbol{y = xArcsinx + \sqrt{1 + x^2}}$

d) $\boldsymbol{y = xArccosx + \sqrt{1 - x^2}}$

e) $\boldsymbol{y = xArccosx - \sqrt{1 + x^2}}$

SORU 11. $y'' + 2y' + y = te^{-t}$, $y(0) = -1$, $y'(0) = -2$ başlangıç değer problemlerine

Laplace dönüşümü uygulandığında elde edilecek ifade aşağıdakilerden hangisidir?

a) $Y(s) = \dfrac{1}{(s+1)^4} + \dfrac{s}{(s+1)^2}$

b) $Y(s) = \dfrac{1}{(s-1)^4} - \dfrac{s}{(s-1)^2}$

c) $Y(s) = \dfrac{1}{(s+1)^4} - \dfrac{s}{(s+1)^2}$

d) $Y(s) = \dfrac{1}{(s-1)^4} - \dfrac{s}{(s+1)^2}$

e) $Y(s) = \dfrac{1}{(s+1)^4} - \dfrac{s}{(s-1)^2}$

SORU 15. $f_1(t) = t^5 e^{-3t}$, $f_2(t) = e^{2t}\sin^2(3t)$ fonksiyonlarının Laplace dönüşümüleri mevcut olduğuna göre $L\left\{\frac{1}{5}f_1(t) + 2f_2(t)\right\}$ değeri aşağıdakilerden hangisidir?

a) $\frac{4!}{(s+3)^6} + \frac{1}{s-2} + \frac{2-s}{(s-2)^2+36}$

b) $\frac{5!}{(s-3)^6} - \frac{1}{s-2} + \frac{s-2}{(s-2)^2+6}$

c) $\frac{4!}{(s+2)^6} + \frac{1}{s+2} + \frac{2-s}{(s-2)^2+36}$

d) $\frac{5!}{(s+3)^6} + \frac{1}{s-2} - \frac{2-s}{(s-2)^2+36}$

e) $\frac{4!}{(s+3)^5} + \frac{1}{s-2} + \frac{2-s}{(s-2)^2+36}$

SORU 16. $y = (-x+4)y' + 2(y')^2$ Lagrange diferansiyel denkleminin çözümü sırasında ortaya çıkan Lineer diferansiyel denklem aşağıdakilerden hangisidir?

a) $\frac{dx}{dp} + \frac{1}{2p}x = \frac{2}{p} + 2$

b) $\frac{dp}{dx} + \frac{1}{2x}p = \frac{x}{2}$

c) $\frac{dx}{dp} + 2x = \frac{p}{2} - 2$

d) $\frac{dx}{dp} - \frac{1}{2p}x = -\frac{p}{2} - 1$

e) $\frac{dx}{dp} - \frac{1}{4p}x = \frac{2}{p} + 2$

SORU 20. $x\dfrac{d^2y}{dx^2}+y=0$ diferansiyel denkleminin $\sum_{n=0}^{\infty} a_n x^n$ şeklindeki kuvvet serisi çözümünde x^3 teriminin katsayısı aşağıdakilerden hangisidir?

A) $\dfrac{2a_1}{5}$

B) $\dfrac{a_1}{6}$ doğru

C) $\dfrac{a_1 - a_0}{7}$

D) $\dfrac{-a_0}{6}$

E) $\dfrac{-a_0}{12}$

SORU 19. $y'' = 1 + (y')^2$ diferansiyel denkleminin genel çözümü aşağıdakilerden hangisidir?

a) $y = -\ln\left[\cos(x+c_1)\right] + c_2$

b) $y = \ln\left[\sin(x+c_1)\right] + c_2$

c) $y = -\ln\left[\sec(x+c_1)\right] + c_2$

d) $y = \ln(x+c_1) + c_2$

e) $y = \ln\left[x+c_1\right] + c_2 x$

SORU 13. $u = u(x)$ve $v = v(x)$ olmak üzere $\begin{matrix} u' = 4u - v \\ v' = -4u + 4v \end{matrix}$ sisteminin çözümü aşağıdakilerden hangisidir?

a) $u(x) = c_1e^{2x} + c_2e^{6x}$, $v(x) = 2c_1e^{2x} - 2c_2e^{6x}$

b) $u(x) = c_1e^{-2x} + c_2e^{6x}$, $v(x) = 2c_1e^{-2x} - 2c_2e^{6x}$

c) $u(x) = c_1e^{2x} + c_2e^{-6x}$, $v(x) = 2c_1e^{2x} - 2c_2e^{-6x}$

d) $u(x) = c_1e^{-2x} + c_2e^{-6x}$, $v(x) = 2c_1e^{-2x} - 2c_2e^{-6x}$

e) $u(x) = c_1e^{2x} - 2c_2e^{6x}$, $v(x) = c_1e^{2x} + c_2e^{6x}$

SORU 8. $y^{\prime V} + 2y''' - 3y'' - 4y' + 4y = tanx$ diferansiyel denkleminin lineer bağımsız çözümlerinden biri xe^{kx} ise k nın alabileceği en büyük değer aşağıdakilerden hangisidir?

a-) 1

b-) -1

c-) 2

d-) -2

e-) 0 Cevap A