Question **1**

Correct

Mark 1 out of 1

Flag question

The general solution of the differential equation $y'' - 6y' + 9y = 0$ is

Select one:

This choice was deleted after the attempt was started.

The correct answer is:
$y(t) = c_1 e^{3t} + c_2 t e^{3t}$

Question **2**

Correct

Mark 1 out of 1

Flag question

The solution of the initial value problem $y'' + 4y = 0$, $y(0) = 2$, $y'(0) = 1$ is

Select one:

- This choice was deleted after the attempt was started. ✖

The correct answer is: $y(t) = 2\cos(2t) + \frac{1}{2}\sin(2t)$

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Question **3**

Correct

Mark 1 out of 1

Flag question

The value of α for which the solution of the initial value problem $y'' + y' - 2y = 0$, $y(0) = \alpha$, $y'(0) = 3$ approaches 0 as $t \to \infty$

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: $-\frac{3}{2}$

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Question **4**

Correct

Mark 1 out of 1

Flag question

The function $y(t) = e^{2t}\cos(t) + e^{2t}\sin t$ is a solution of the differential equation

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: $y'' - 4y' + 5y = 0$

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Question **5**

Correct

Mark 1 out of 1

Flag question

The general solution of the differential equation $y'' - 2y' + 3y = 0$ is

Select one:

- This choice was deleted after the attempt was started.

The correct answer is:
$y(t) = c_1 e^t \cos(\sqrt{2}t) + c_2 e^t \sin(\sqrt{2}t)$

Question **6**

Incorrect

Mark 0 out of 1

Flag question

Given that $W(y_1, y_2)(t) = t^4$, $y_1(t) = t^2$, then a possible function of $y_2(t)$ is

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: $t^3 + 2t^2$

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Question **7**

Incorrect

Mark 0 out of 1

Flag question

The longest interval in which a unique solution of the initial value problem $t(\ln t)y'' + ty' + y = \csc t$, $y(2) = 1, y'(2) = 1$ is certain to exist is

Select one:

- This choice was deleted after the attempt was started. ✖

The correct answer is: $(1, \pi)$

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Question **8**

Correct

Mark 1 out of 1

Flag question

The general solution of the differential equation $2y'' + y' - y = 0$ is

Select one:

- This choice was deleted after the attempt was started.

The correct answer is:
$y(t) = c_1 e^{-t} + c_2 e^{t/2}$

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Question 9

Correct

Mark 1 out of 1

Flag question

The function $y_1(x) = x$ is a solution of the differential equation $(1 - x^2)y'' + 2xy' - 2y = 0$, $x \in (-1, 1)$. Using the method of reduction of order, a second solution $y_2(x)$ is

Select one:

- This choice was deleted after the attempt was started. ✖

The correct answer is: $1 + x^2$

Question **10**

Incorrect

Mark 0 out of 1

Flag question

The Wronskian of any solutions y_1 and y_2 of the differential equation $((x+1)y')' + 2y = 0, x > -1$ is

Select one:

- This choice was deleted after the attempt was started. ✖

The correct answer is: $C(x+1)^{-1}$

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Question 1

Incorrect

Mark 0 out of 1

Flag question

Using the method of undetermined coefficients, let $Y(t)$ be a particular solution of the differential equation $y^{(4)} - y^{(3)} = -24t$, then $Y(-1) =$

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: -3

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Question **2**

Correct

Mark 1 out of 1

Flag question

The general solution of the differential equation

$y^{(4)} + 2y^{(3)} + 4y'' - 2y' - 5y = 0$

is

Select one:

- This choice was deleted after the attempt was started.

The correct answer is:

$y(y) = c_1 e^t + c_2 e^{-t} + c_3 e^{-t}\cos(2t) + c_4 e$

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Question **3**

Incorrect

Mark 0 out of 1

Flag question

The general form of a particular solution of the differential equation $y^{(4)} + 2y'' + y = t\cos t$ is

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: $Y(t) = (At^3 + Bt^2)\cos t + (Ct^3 + Dt^2)\,\mathrm{si}$

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Question **4**

Correct

Mark 1 out of 1

Flag question

A particular solution of the differential equation $y'' - 2y' + y = \frac{e^t}{t}, t > 0$, has the form $Y(t) = v_1(t)e^t + v_2(t)te^t$ where $v_2(t) =$

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: $\ln t$

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Question **5**

Correct

Mark 1 out of 1

Flag question

Using the method of undetermined coefficients, let $Y(t)$ be a particular solution of the differential equation $y''' - y = e^t$, then $Y(2) =$

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: $\frac{2}{3}e^2$

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Question **6**

Correct

Mark 1 out of 1

Flag question

The general form of a particular solution of the differential equation $y^{(4)} + 2y^{(3)} + y'' = 1 + t\sinh t$

Select one:

- This choice was deleted after the attempt was started. ✖

The correct answer is: $Y(t) = At^2 + (Bt + C)e^t + (Dt^3 + Et^2)e$

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Question 7

Incorrect

Mark 0 out of 1

Flag question

Using the method of undetermined coefficients, let $Y(t)$ be a particular solution of the differential equation $y'' + y' = t^2$, then $Y(1) =$

Select one:

- This choice was deleted after the attempt was started.

The correct answer is: $\frac{4}{3}$

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Question **8**

Incorrect

Mark 0 out of 1

Flag question

The general form of a particular solution of the differential equation $y'' - y' = te^t$ is

Select one:

- This choice was deleted after the attempt was started. ✖

The correct answer is: $Y(t) = (At^2 + Bt)e^t$

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Question **9**

Correct

Mark 1 out of 1

Flag question

A particular solution of the differential equation $y'' + y = \sec^2 t$ has the form
$Y(t) = u_1(t)\cos t + u_2(t)\sin t$
where $u_2(t) =$

Select one:

- This choice was deleted after the attempt was started.

The correct answer is:
$\ln|\sec t + \tan t|$

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Question **10**

Correct

Mark 1 out of 1

Flag question

If $Y_1 = 1 + 2t$, $Y_2(t) = 1 + t + e^t$ are solutions of a second order nonhomogeneous differential equation then one of the following is a solution of the corresponding homogeneous equation

Select one:

- This choice was deleted after the attempt was started. ✖

The correct answer is: $t - e^t$

Question 1

Correct

Marked out of 2.00

Flag question

The **inverse Laplace transform** $\mathcal{L}^{-1}\left\{\frac{s}{s^2+6s+10}\right\}$ equals

Select one:

- $e^{2t}\left(\cos 2t+\sin 2t\right)$
- $e^{3t}\left(\cos t+3\sin t\right)$
- $e^{-2t}\left(\cos 2t-\sin 2t\right)$
- $e^{-3t}\left(\cos t-3\sin t\right)$ ✔
- $e^{3t}\left(\cos t+3\sin t\right)$

The correct answer is:
$e^{-3t}\left(\cos t-3\sin t\right)$

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$e^{-3t}\left(\cos t - 3\sin t\right)$

Question **2**

Correct

Marked out of 2.00

Flag question

Given the initial value problem:
$x^2y'' + 3xy' - 3y = 0,\ x > 0 \quad y(1) = 0,\ \ y'(1)$
Then $y(-1) =$

$y'(1) = 4$

Select one:

- $\frac{15}{8}$
- 0 ✔
- 2
- $-\frac{15}{8}$
- -2

The correct answer is: 0

Question **3**

Correct

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Question **3**

Correct

Marked out of 2.00

Flag question

The Laplace transform of the solution of the IVP:

$$f''(t) - f'(t) + f(t) = 1,\ f(0) = f'(0) = 0$$

satisfies:

Select one:

- $F(s) = \frac{1}{s(s^2+s-1)}$
- $F(s) = \frac{1}{s(s^2-s+1)}$ ✔
- $F(s) = \frac{1}{s(s^2-s-1)}$
- $F(s) = \frac{1}{s(s^2+s+1)}$
- $F(s) = \frac{1}{s^2(s^2-s-1)}$

The correct answer is:

$F(s) = \frac{1}{s(s^2-s+1)}$

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Use the table of Laplace transforms or the formula:

$$\mathcal{L}\{t^n f(t)\} = (-1)^n \frac{d^n}{ds^n}\left(\mathcal{L}\{f(t)\}\right)$$

,

to determine the following expressions.

$$\mathcal{L}\{t \sin 2t\}$$

- $\frac{2s}{(s^2+1)^2}$
- $\frac{s^2-9}{(s^2+9)^2}$
- $\frac{s^2-4}{(s^2+4)^2}$
- $\frac{4s}{(s^2+4)^2}$
- $\frac{s^2-1}{(s^2+1)^2}$
- $\frac{6s}{(s^2+9)^2}$

The correct answer is: $\frac{4s}{(s^2+4)^2}$

$$\mathcal{L}\{t^2 \sin 2t\}$$

- $\frac{2s(s^2-27)}{(s^2+9)^3}$
- $\frac{2(3s^2-1)}{(s^2+1)^3}$
- $\frac{4(3s^2-4)}{(s^2+4)^3}$
- $\frac{2s(s^2-12)}{(s^2+4)^3}$
- $\frac{2s(s^2-3)}{(s^2+1)^3}$
- $\frac{18(s^2-3)}{(s^2+9)^3}$

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3
1a

Use the table of Laplace transforms or the formula:

$\mathcal{L}^{-1}\{\frac{d^n}{ds^n}(F(s))\} = (-t)^n \mathcal{L}^{-1}\{F(s)\}$

,

to determine the following expressions.

$\mathcal{L}^{-1}\{-4(s^2-4)^{-1}\}$

- $-2\ \sinh(t)$
- $-2\ e^{t}\ \sinh(4\ t)$
- $2\ e^{-t}\ \sinh(4\ t)$
- $-2\ e^{4t}\ \sinh(t)$
- $-2\ \sinh(2\ t)$ ✓
- $2\ e^{-4t}\ \sinh(t)$

The correct answer is: $-2\ \sinh(2\ t)$

$\mathcal{L}^{-1}\{\ln\left(\frac{s+2}{s-2}\right)\}$

- $\frac{2e^{4t}\ \sinh(t)}{t}$
- $\frac{2\sinh(2t)}{t}$ ✓
- $\frac{2\sinh(t)}{t}$
- $-\frac{2e^{-4t}\ \sinh(t)}{t}$
- $-\frac{2e^{-t}\sinh(4t)}{t}$
- $\frac{2e^{t}\sinh(4t)}{t}$

The correct answer is: $\frac{2\sinh(2t)}{t}$

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Question 1

Correct

Marked out of 1.50

Flag question

The order of the differential equation $y^6 y'' + y^3 y' = \sin t$ is

Select one:

- 5
- 4
- 2 ✔
- 3
- 8

The correct answer is: 2

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Question **2**

Incorrect

Marked out of 2.00

Flag question

An **integrating factor** for the differential equation

$$-2y' - \frac{1}{x}y = e^x, \quad x > 0$$

Select one:

- $x^{-1/2}$ ✖
- $x^{1/2}$
- $-\frac{1}{x}$
- $\frac{1}{x}$
- x^{-2}

The correct answer is: $x^{1/2}$

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Question **3**

Incorrect

Marked out of 2.00

Flag question

The values of m for which $y = x^m$ is a solution of
$x^2y'' - 7xy' + 12y = 0$ are

Select one:

- 3 and -4 ✖
- -2 and -6
- 3 and 4
- -3 and 4
- 2 and 6

The correct answer is: 2 and 6

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Question **4**

Incorrect

Marked out of 3.00

Flag question

The solution of the I.V.P.
$xy\frac{dy}{dx} = x^2 + y^2, y(1) = 1$ is

Select one:

- $2\ln|x| = \left(\frac{y}{x}\right)^2 - 1$
- $\ln|x| = \left(\frac{y}{x}\right)^2 - 1$
- $2\ln|x| = \left(\frac{y}{x}\right)^2 - 4$
- $2\ln|x| = \left(\frac{y}{x}\right)^2 + 4$
- $-2\ln|x| = \left(\frac{y}{x}\right)^2 - 1$ ✖

The correct answer is:
$2\ln|x| = \left(\frac{y}{x}\right)^2 - 1$

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Question 5

Correct

Marked out of 1.50

Flag question

The differential equation
$t^2y' + y^2 = ty$ is

Select one:

- nonlinear separable equation
- first order linear homogeneous equation
- first order nonlinear homogeneous equation ✔
- first order linear equation
- linear separable equation

The correct answer is: first order nonlinear homogeneous equation

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Question **6**

Correct

Marked out of 2.00

Flag question

If all solutions of the differential equation $y' = ay + b$ converge to -2 then possible values for a and b are

Select one:

- $a = -1, b = -2$ ✓
- $a = -1, b = 2$
- $a = 1, b = -2$
- $a = 1, b = 2$

The correct answer is:
$a = -1, b = -2$

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An **integrating factor** that makes the differential equation $2ye^x dx + (y + e^x)dy = 0$ exact is

Select one:

- $\sqrt{y}$
- e^y
- e^x
- $\frac{1}{\sqrt{y}}$ ✔

The correct answer is: $\frac{1}{\sqrt{y}}$

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Question **2**

Incorrect

Marked out of 2.00

Flag question

According to the **Existence and Uniqueness Theorem,** the IVP $\frac{dy}{dx} = \frac{\sqrt{y^2-4}}{x}$, $y(\alpha) = \beta$ has a unique solution if

Select one:

- $\alpha = 0, \beta = 0$
- $\alpha = 1, \beta = -1$ ✖
- $\alpha = 0, \beta = 1$
- $\alpha = 1, \beta = 3$

The correct answer is: $\alpha = 1, \beta = 3$

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Question 3

Incorrect

Marked out of 2.00

Flag question

Using the substitution $v = y^{-1}$, the differential equation $y' - y = x^2y^2, \; x > 0$ can be written as

Select one:

- $v' - \frac{1}{x}v = -x$
- $v' - v = -x^2$ ✖
- $v' + \frac{1}{x}v = -x$
- $v' + v = -x^2$

The correct answer is: $v' + v = -x^2$

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Question **4**

Correct

Marked out of 2.00

Flag question

If the differential equation

$$\left(x^2y+\frac{y}{x}+\sec y+y\right)dx+\left(\frac{1}{3}x^3+\ln x+xS(\right.$$

is exact, then $S(y) =$

$$(xS(y)+x)\,dy$$

$$=0$$

Select one:

- $1+\sec y$
- $\tan y$
- $\sec y \tan y$ ✔
- $\sec y$

The correct answer is: $\sec y \tan y$

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Question **5**

Correct

Marked out of 2.00

Flag question

The **largest interval** in which a solution of the IVP $y' + (\ln t)y = \tan t, \quad y(\frac{\pi}{4}) = 1$ is certain to exist is

Select one:

- $(1, \infty)$
- $(0, 1)$
- $(0, \frac{\pi}{2})$ ✔
- $(0, \pi)$

The correct answer is: $(0, \frac{\pi}{2})$

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Question **6**

Correct

Marked out of 2.00

Flag question

A small metal bar is dropped into a large container of boiling water (that is the temperature of the medium around the metal bar $100°C$). Initially the temperature of the bar is measured to be $20°C$. After $t = 1$ second, the temperature of the bar increases to $60°C$. The temperature of the bar at $t = 4$ equals

Select one:

- $95°C$ ✔
- $110°C$
- $105°C$
- $90°C$

The correct answer is: $95°C$

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Question **1**

Correct

Marked out of 2.00

Flag question

The solution of the IVP
$y'' - 2ky' + k^2y = 0,\ k > 0,\ y(0) = 1,\ y'(0)$
is

$y'(0) = 0$

Select one:

- $y = (1 - kt)e^{kt}$
- $y = (1 + t)e^{kt}$
- $y = te^{kt} + 1$
- $y = (1 - kt)e^{kt}$ ✔

The correct answers are:
$y = (1 - kt)e^{kt}$
, $y = (1 - kt)e^{kt}$

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Question **2**

Correct

Marked out of 2.00

Flag question

Consider the IVP $y' = t^2 - y$, $y(0) = 0$. Using **Picard's method**

Select one:

- $\phi_2(t) = \frac{t^3}{3} - \frac{t^4}{4!}$
- $\phi_2(t) = \frac{t^3}{3!} - \frac{t^4}{4!}$
- $\phi_2(t) = \frac{t^3}{3} - \frac{t^4}{12}$ ✔
- $\phi_2(t) = \frac{t^3}{3!} - \frac{t^4}{12}$

The correct answer is:
$\phi_2(t) = \frac{t^3}{3} - \frac{t^4}{12}$

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Question 3

Correct

Marked out of 2.00

Flag question

The general solution of the differential equation $y'' = (y')^2$ is

Select one:

- $y(t) = -\ln|t + c_1| + c_2$ ✔
- $y(t) = c_1 e^t + c_2 e^{-t}$
- $y(t) = \ln|t + c_1| + c_2$
- $y(t) = c_1 e^t + c_2$

The correct answer is:
$y(t) = -\ln|t + c_1| + c_2$

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Question **4**

Correct

Marked out of 2.00

Flag question

A second order linear homogeneous differential equation with constant coefficients has $r_1 = -1 + 2i$, $r_2 = -1 - 2i$ as roots of its auxiliary equation. Then this differential equation is

Select one:

- $y'' + 3y = 0$
- $y'' - 2y' + 5y = 0$
- $y'' - 3y' + 4y = 0$
- $y'' + 2y' + 5y = 0$ ✓

The correct answer is:
$y'' + 2y' + 5y = 0$

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Question **5**

Correct

Marked out of 2.00

Flag question

The solution of the IVP $y'' + y = 0,\ y(0) = 0,\ y'(0) = 1$ is

Select one:

- $y(t) = \sin t$ ✓
- $y(t) = \sinh t$
- $y(t) = e^t - 1$
- $y(t) = \cosh t$

The correct answer is: $y(t) = \sin t$

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Question **6**

Correct

Marked out of 2.00

Flag question

Given that $y_1(t) = e^t$ is a solution of the differential equation $y'' - y' = 0$. If $y(t) = u(t)e^t$ is a second solution, then the function $u(t)$ satisfies the differential equation:

Select one:

- $u'' + u = 0$
- $u'' + 2u' = 0$
- $u'' + 2u = 0$
- $u'' + u' = 0$ ✔

The correct answer is: $u'' + u' = 0$

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