Assignment 4

You are to submit the assignment by the due date. 

Due on 2021-02-17, 25th HST.

Task 1: (This task is worth 1 point.)

You are given the following function:

f(x) = \frac{1}{x^2 + 1}

Find the value of f(x) at x = 1.

Task 2: (This task is worth 2 points.)

You are given the following sequence:

a_n = \frac{1}{n}

Find the sum of the first 10 terms of this sequence.

Task 3: (This task is worth 1 point.)

You are given the following matrix:

A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}

Find the determinant of matrix A.

Task 4: (This task is worth 2 points.)

You are given the following differential equation:

\frac{dy}{dx} = x - 1

Find the general solution of this differential equation.

Task 5: (This task is worth 1 point.)

You are given the following integral:

\int_0^1 x^2 dx

Find the value of this integral.

Task 6: (This task is worth 2 points.)

You are given the following vector:

\mathbf{v} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}

Find the magnitude of this vector.

Task 7: (This task is worth 1 point.)

You are given the following optimization problem:

\text{Maximize } f(x, y) = x^2 + y^2 \text{ subject to } x + y = 1

Find the values of x and y that maximize f(x, y).

Task 8: (This task is worth 2 points.)

You are given the following series:

\sum_{n=1}^{\infty} \frac{1}{n^2}

Find the value of this series.

Task 9: (This task is worth 1 point.)

You are given the following problem:

Find the area of the region bounded by the curves y = x^2 and y = x.

Find the area of this region.

Task 10: (This task is worth 2 points.)

You are given the following probability distribution:

\text{P(X = x)} = \begin{cases} 0.2 & \text{if } x = 1 \\ 0.3 & \text{if } x = 2 \\ 0.5 & \text{if } x = 3 \end{cases}

Find the expected value of this distribution.

Task 11: (This task is worth 1 point.)

You are given the following graph:

\begin{tikzpicture}

\draw (0,0) -- (1,1);
\draw (1,0) -- (0,1);
\end{tikzpicture}

Find the number of paths from vertex A to vertex B.

Task 12: (This task is worth 2 points.)

You are given the following equation:

x^2 + y^2 = 1

Find the points on the unit circle that satisfy this equation.

Task 13: (This task is worth 1 point.)

You are given the following system of equations:

\begin{align*}
2x + 3y &= 7 \\
4x + 6y &= 14
\end{align*}

Find the values of x and y that satisfy this system.

Task 14: (This task is worth 2 points.)

You are given the following matrix:

A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}

Find the inverse of matrix A.

Task 15: (This task is worth 1 point.)

You are given the following inequality:

x^2 - 4x + 3 \leq 0

Find the range of values of x that satisfy this inequality.

Task 16: (This task is worth 2 points.)

You are given the following integral:

\int_0^1 \sqrt{1 + x^2} dx

Find the value of this integral.

Task 17: (This task is worth 1 point.)

You are given the following sequence:

a_n = \begin{cases} n & \text{if } n \text{ is even} \\ n+1 & \text{if } n \text{ is odd} \end{cases}

Find the sum of the first 10 terms of this sequence.

Task 18: (This task is worth 2 points.)

You are given the following series:

\sum_{n=1}^{\infty} \frac{1}{n^2}

Find the value of this series.

Task 19: (This task is worth 1 point.)

You are given the following optimization problem:

\text{Minimize } f(x, y) = x^2 + y^2 \text{ subject to } x + y = 1

Find the values of x and y that minimize f(x, y).

Task 20: (This task is worth 2 points.)

You are given the following matrix:

A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}

Find the determinant of matrix A.

Task 21: (This task is worth 1 point.)

You are given the following integral:

\int_0^1 x^2 dx

Find the value of this integral.

Task 22: (This task is worth 2 points.)

You are given the following sequence:

a_n = \begin{cases} n & \text{if } n \text{ is even} \\ n+1 & \text{if } n \text{ is odd} \end{cases}

Find the sum of the first 10 terms of this sequence.

Task 23: (This task is worth 1 point.)

You are given the following optimization problem:

\text{Minimize } f(x, y) = x^2 + y^2 \text{ subject to } x + y = 1

Find the values of x and y that minimize f(x, y).

Task 24: (This task is worth 2 points.)

You are given the following matrix:

A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}

Find the determinant of matrix A.