CSE 330: Spring 2024
Assignment-2 [CO4]
Total Marks: 30

1. Consider the following table of data points/nodal points:

Time t (sec)	Velocity (ms^-1) v(t)
2	10
4	20
6	25

a. **[4+1 marks]** Find an interpolating polynomial of velocity that goes through the above data points by using **Vandermonde Matrix** method. Also compute an approximate value of acceleration at Time, **t=7 sec.**
b. **[4 marks]** Find an interpolating polynomial of velocity that goes through the above data points by using **Lagrange** method.
c. **[2 marks]** If a **new data point** is added in the above scenario, which method should you use in finding a new interpolating polynomial? Also what will be the degree of that new polynomial?

2. Read the following and answer accordingly:

a. **(4 marks)** Consider the nodes **[−π/2, 0, π/2]**. Find an interpolating polynomial of appropriate degree by using **Newton's divided-difference** method for **f(x) = x sin(x)** .
b. **(2 marks)** Use the interpolating polynomial to find an approximate value at **π/4**, and compute the percentage relative error at **π/4**.
c. **(4 marks)** Add a new node **π** to the above nodes, and find the interpolating polynomial of appropriate degree.

3. An interpolating polynomial, $\mathbf{p_1(x) = 1.648(x - 1)}$ is derived for the function **f(x) = x ln x** at the nodes $\mathbf{(x_0 = 1, x_1 = 3)}$ using the Lagrange method. Answer the following keeping up to 4 significant figures.

a. **(1 marks)** Explain what you need to do to obtain a **degree 3** interpolating polynomial for the same function f(x) and for the same nodal points $\mathbf{(x_0 = 1, x_1 = 3)}$.
b. **(6 marks)** Calculate the bases of the **degree 3** polynomial.
c. **(2 marks)** Find the hermite polynomial using the bases found in **(b)**.