Instructions for preparing the solution script:

- Write your name, ID#, and Section number clearly in the very front page.
- Write all answers sequentially.
- Start answering a question (not the pat of the question) from the top of a new page.
- Write legibly and in orderly fashion maintaining all mathematical norms and rules. Prepare a single solution file.
- Start working right away. There is no late submission form. If you miss the deadline, you need to use the make-up assignment to cover up the marks.

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1. Consider the following data points given below and answer the question based on these data:

x	0	1	2
$f(x)$	0	1	0

   (a) (4 marks) Sketch the given data, and write what type of interpolation polynomial is expected. Also write the properties of the interpolated curve (that is, write if the curve is facing up, down, right or left, sfifted up, down, left or right, etc).

   (b) (3 marks) Compute the Lagrange basis of the interpolation polynomial for the given data.

   (c) (8 marks) Compute the interpolation polynomial, and also express it in (i) natural or Taylor basis and also (ii) in the form $a(x-b)^2+c$, where the parameters represent stretching and shifting parameters. Finally make comments if these parameters agree and/or disagree with the properties found in Part-(a).

2. Read the following and answer accordingly:

   (a) (6 marks) Find an interpolating polynomial of appropriate degree using the Newton's divided-difference method for $f(x) = \cos(x)$. Consider the nodes $[0, \pi/2, \pi]$.

   (b) (2 marks) Use the interpolated polynomial to find an approximate value at $\pi/4$, and compute the relative error at $\pi/4$.

   (c) (3 marks) Add a new node $-\pi/2$ to the above nodes, and find the interpolating polynomial.

   (d) (4 marks) Compute the upper bound of the interpolation error of the interpolating polynomial with four nodes.