

Worksheet  
11/08/2019

Name: \_\_\_\_\_

Let  $P$  be the polynomial of degree  $\leq 3$  that interpolates the data  $(1,1)$ ,  $(2,1)$ ,  $(3,2)$ ,  $(0,-1)$ . Last time, we found  $P$  in Lagrange form. Now find  $P$  in Newton form.

$$\begin{array}{l}
 1 \\
 2 \\
 3 \\
 0
 \end{array}
 \begin{array}{l}
 1 \\
 1 \\
 2 \\
 -1
 \end{array}
 \begin{array}{l}
 \frac{1-1}{2-1} = 0 \\
 \frac{2-1}{3-2} = 1 \\
 \frac{2-(-1)}{3-0} = 1
 \end{array}
 \begin{array}{l}
 \\
 \\
 \\
 \end{array}
 \begin{array}{l}
 \\
 \frac{1-0}{3-1} = \frac{1}{2} \\
 \frac{1-1}{0-2} = 0
 \end{array}
 \begin{array}{l}
 \\
 \\
 \frac{1/2-0}{1-0} = \frac{1}{2}
 \end{array}$$

$\begin{matrix} =c_0 \\ =c_1 \\ =c_2 \\ =c_3 \end{matrix}$

Therefore,

$$\begin{aligned}
 P(x) &= c_0 + c_1(x-x_1) + c_2(x-x_1)(x-x_2) + c_3(x-x_1)(x-x_2)(x-x_3) \\
 &= 1 + 0(x-1) + \frac{1}{2}(x-1)(x-2) + \frac{1}{2}(x-1)(x-2)(x-3) \\
 &= \dots \quad (\text{simplify})
 \end{aligned}$$