Class exercise 4.1 part 3 | Christopher Koepke

1. Construct a Lagrange polynomial of the least degree for the following table of values.

x	0	2	3	4
$f(x)$	7	11	28	63

$$P(x) = l_0(x)y_0 + l_1(x)y_1 + l_2(x)y_2 + l_3(x)y_3$$

$$l_0(x) = \frac{(x-x_1)(x-x_2)(x-x_3)}{(x_0-x_1)(x_0-x_2)(x_0-x_3)} \qquad l_2(x) = \frac{(x-x_0)(x-x_1)(x-x_3)}{(x_2-x_0)(x_2-x_1)(x_2-x_3)}$$

$$l_1(x) = \frac{(x-x_0)(x-x_2)(x-x_3)}{(x_1-x_0)(x_1-x_2)(x_1-x_3)} \qquad l_3(x) = \frac{(x-x_0)(x-x_1)(x-x_2)}{(x_3-x_0)(x_3-x_1)(x_3-x_2)}$$

$$P(x) = \frac{(x-2)(x-3)(x-4)}{(0-2)(0-3)(0-4)}(7) + \frac{(x-0)(x-3)(x-4)}{(2-0)(2-3)(2-4)}(11) +$$

$$\frac{(x-0)(x-2)(x-4)}{(3-0)(3-2)(3-4)}(28) + \frac{(x-0)(x-2)(x-3)}{(4-0)(4-2)(4-3)}(63)$$

$$P(x) = \frac{(x-2)(x-3)(x-4)}{-24}(7) + \frac{(x-0)(x-3)(x-4)}{4}(11) + \frac{(x-0)(x-2)(x-4)}{-3}(28)$$

$$+ \frac{(x-0)(x-2)(x-3)}{8}(63)$$