3 $f(x) = e^x$, $x_0 = 0$, $x_1 = 1$, $x_2 = 2$, $x_3 = 3$ $n = 3$

$$P_3(x) = f(x_0)\,l_0(x) + f(x_1)\,l_1(x) + f(x_2)\,l_2(x) + f(x_3)\,l_3(x)$$

$$l_0(x) = \prod_{i=1}^{3} \frac{x - x_i}{x_0 - x_i} = \frac{x - x_1}{x_0 - x_1}\,\frac{x - x_2}{x_0 - x_2}\,\frac{x - x_3}{x_0 - x_3} = \frac{x-1}{0-1}\,\frac{x-2}{0-2}\,\frac{x-3}{0-3}$$

$$= -\frac{1}{6}(x-1)(x^2 - 5x + 6) = -\frac{1}{6}(x^3 - 6x^2 + 12x - 6)$$

$$l_1(x) = \prod_{\substack{i=0\\ i\neq 1}}^{3} \frac{x - x_i}{x_1 - x_i} = \frac{x - x_0}{x_1 - x_0}\,\frac{x - x_2}{x_1 - x_2}\,\frac{x - x_3}{x_1 - x_3} = \frac{x-0}{1-0}\,\frac{x-2}{1-2}\,\frac{x-3}{1-3}$$

$$= \frac{1}{2}x(x^2 - 5x + 6) = \frac{1}{2}(x^3 - 5x^3 + 6x)$$

$$l_2(x) = \prod_{\substack{i=0\\ i\neq 1}}^{3} \frac{x - x_i}{x_2 - x_i} = \frac{x - x_0}{x_2 - x_0}\,\frac{x - x_1}{x_2 - x_1}\,\frac{x - x_3}{x_2 - x_3} = \frac{x-0}{2-0}\,\frac{x-1}{2-1}\,\frac{x-3}{2-3}$$

$$= -\frac{1}{2}x(x^2 - 4x + 3) = -\frac{1}{2}(x^3 - 4x^2 + 3x)$$