$$\ell_2(x) = \frac{x-1}{x_0-1} \cdot \frac{x-x_1}{x_0-x_1} \cdot \frac{x-x_3}{x_0-x_3}$$

$$= \frac{x-1}{0-1} \cdot \frac{x-x_2}{x_1-x_2} \cdot \frac{x-x_3}{x_1-x_3}$$

$$\ell_2(x) = \frac{x+2}{0+2} \cdot \frac{x+1}{0+1} \cdot \frac{x-2}{0-2}$$

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

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

$$= -\frac{1}{4}(x^4 - 5x^2 + 4)$$

$$\ell_2(x_2) = -\frac{1}{4}\left((-2)^4 - 5(-2)^2 + 4\right) = \varnothing \neq P(x_2)$$

$$\ell_3(x) = \frac{x-0}{x_0} \cdot \frac{x-x_1}{x-x_1} \cdot \frac{x-x_2}{x-x_2}$$

$$= \frac{x}{x_3} \cdot \frac{x+2}{x_3} \cdot \frac{x+1}{x_3}$$

$$= \frac{x}{2} \cdot \frac{x+1}{1} \cdot \frac{x-2}{-2} = \frac{1}{2}(x+2)(x+1)(x-2)$$

$$= -\frac{1}{6}(x^3 + x^2 - 4x - 4x)$$

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

$$\ell_3(x_3) = \frac{1}{2}\left((-2)^4 - 4(-2)^2 - 4(-2)^2 + (-2)^2 - (-2)\right) = \varnothing \neq P(x_3)$$