a.

$$L_0 = \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)}$$

$$L_1 = \frac{(x-x_0)(x-x_2)}{(x_1-x_0)(x_1-x_2)}$$

$$L_2 = \frac{(x-x_0)(x-x_1)}{(x_2-x_0)(x_2-x_1)}$$

$$p(x) = f(x_0)L_0 + f(x_1)L_1 + f(x_2)L_2$$

$$p(x) = \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)}f(x_0) + \frac{(x-x_0)(x-x_2)}{(x_1-x_0)(x_1-x_2)}f(x_1) + \frac{(x-x_0)(x-x_1)}{(x_2-x_0)(x_2-x_1)}f(x_2)$$

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b.

$f'(x_0) \approx p'(x_0)$; $h = x_1 - x_0 = x_2 - x_1$

$2h = x_2 - x_0$

$$p'(x) = \frac{f(x_0)}{(x_0-x_1)(x_0-x_2)}((x-x_2)+(x-x_1))$$
$$+ \frac{f(x_1)}{(x_1-x_0)(x_1-x_2)}((x-x_2)+(x-x_0))$$
$$+ \frac{f(x_2)}{(x_2-x_0)(x_2-x_1)}((x-x_1)+(x-x_0))$$

$$p'(x) = \frac{f(x_0)}{(-h)(-2h)}(2x-(x_1+x_2)) + \frac{f(x_1)}{h(-h)}(2x-(x_2+x_0))$$
$$+ \frac{f(x_2)}{(2h)(h)}(2x-(x_1+x_0)$$

$$p'(x) = \frac{1}{h^2}\left(\frac{f(x_0)}{2}(2x-(x_1+x_2)) - f(x_1)(2x-(x_2+x_0)) + \frac{f(x_2)}{2}(2x-(x_1+x_0))\right)$$

$$p'(x_0) = \frac{1}{h^2}\left(\frac{f(x_0)}{2}(-2h-h) - f(x_1)(-2h) + \frac{f(x_2)}{2}(-h)\right)$$

$$p'(x_0) = \frac{-3}{2h}f(x_0) + \frac{2f(x_1)}{h} - \frac{f(x_2)}{2h}$$

Norma

$$f'(x_0) = \frac{1}{2h}\left(-3f(x_0) + 4f(x_0+h) - f(x_0+2h)\right)$$