Punto 2.

Para 3 puntos

$$\Omega = \{(t_{n-2}, f_{n-2}), (t_{n-1}, f_{n-1}), (t_n, f_n)\}$$

$$P(x) = \prod_{i \neq j, i=0}^{n} \frac{x - x_i}{x_j - x_i}$$

$$P(t) = \frac{(t - t_n)(t - t_{n-1})}{(t_{n-2} - t_n)(t_{n-2} - t_{n-1})} f_{n-2} + \frac{(t - t_n)(t - t_{n-2})}{(t_{n-1} - t_n)(t_{n-1} - t_{n-2})} f_{n-1}$$

$$+ \frac{(t - t_{n-2})(t - t_{n-1})}{(t_n - t_{n-2})(t_n - t_{n-1})} f_n$$

* Tomando $h = t_p - t_{p-1}$

$$P(t) = \frac{(t - t_n)(t - t_{n-1})}{2h^2} f_{n-2} + \frac{(t - t_n)(t - t_{n-2})}{-h^2} f_{n-1}$$

$$+ \frac{(t - t_{n-2})(t - t_{n-1})}{2h^2} f_n$$

* $t_{p-1} = t_p - h$ * $t' = t - t_n$ * $dt' = dt$

$$P(t) = \frac{(t - t_n)(t - t_n + h)}{2h^2} f_{n-2} + \frac{(t - t_n)(t - t_n + 2h)}{-h^2} f_{n-1}$$

$$+ \frac{(t - t_n + 2h)(t - t_n + h)}{2h^2} f_n$$

$$P(t) = \frac{t'(t' + h)}{2h^2} f_{n-2} + \frac{t'(t' + 2h)}{-h^2} f_{n-1} + \frac{(t' + 2h)(t' + h)}{2h^2} f_n$$

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Haciendo la integral:

$$y_{n+1}-y_n=\int_0^h\left[\frac{t'(t'+h)}{2h^2}f_{n-2}+\frac{t'(t'+2h)}{-h^2}f_{n-1}+\frac{(t'+2h)(t'+h)}{2h^2}f_n\right]dt'$$

$$* \int_0^h \frac{t'(t'+h)}{2h^2}f_{n-2}\,dt'=\left(\frac{h}{6}+\frac{h}{4}\right)f_{n-2}=\frac{5h}{12}f_{n-2}$$

$$* \int_0^h \frac{t'(t'+2h)}{-h^2}f_{n-1}\,dt'=\left(-\frac{h}{3}-h\right)f_{n-1}=-\frac{4h}{3}f_{n-1}$$

$$* \int_0^h \frac{(t'+2h)(t'+h)}{2h^2}f_n\,dt'=\frac{23h}{12}f_n$$

$$y_{n+1}-y_n=\frac{5h}{12}f_{n-2}-\frac{4h}{3}f_{n-1}+\frac{23h}{12}f_n$$

$$y_{n+1}=y_n+\frac{h}{12}\left(23f_n-16f_{n-1}+5f_{n-2}\right)$$

Para 4 puntos

$$\Omega=\{(t_{n-3},f_{n-3}),(t_{n-2},f_{n-2}),(t_{n-1},f_{n-1}),(t_n,f_n)\}$$

$$P(t)=\frac{(t-t_{n-2})(t-t_{n-1})(t-t_n)}{(t_{n-3}-t_{n-2})(t_{n-3}-t_{n-1})(t_{n-3}-t_n)}f_{n-3}+\frac{(t-t_{n-3})(t-t_{n-1})(t-t_n)}{(t_{n-2}-t_{n-3})(t_{n-2}-t_{n-1})(t_{n-2}-t_n)}f_{n-2}$$

$$+\frac{(t-t_{n-3})(t-t_{n-2})(t-t_n)}{(t_{n-1}-t_{n-3})(t_{n-1}-t_{n-2})(t_{n-1}-t_n)}f_{n-1}+\frac{(t-t_{n-3})(t-t_{n-2})(t-t_{n-1})}{(t_n-t_{n-3})(t_n-t_{n-2})(t_n-t_{n-1})}f_n$$

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$$P(t) = \frac{(t - t_n + 2h)(t - t_n + h)(t - t_n)}{(-h)(-2h)(-3h)} f_{n-3}$$

$$+ \frac{(t - t_n + 3h)(t - t_n + h)(t - t_n)}{(h)(-h)(-2h)} f_{n-2}$$

$$+ \frac{(t - t_n + 3h)(t - t_n + 2h)(t - t_n)}{(2h)(h)(-h)} f_{n-1}$$

$$+ \frac{(t - t_n + 3h)(t - t_n + 2h)(t - t_n + h)}{(3h)(2h)(h)} f_n$$

$$P(t) = \frac{(t' + 2h)(t' + h)\, t'}{-6h^3} f_{n-3} + \frac{(t' + 3h)(t' + h)\, t'}{2h^3} f_{n-2}$$

$$+ \frac{(t' + 3h)(t' + 2h)\, t'}{-2h^3} f_{n-1} + \frac{(t' + 3h)(t' + 2h)(t' + h)}{6h^3} f_n$$

$$* \int_0^h \frac{t'(t' + 2h)(t' + h)}{-6h^3} \, dt' \, f_{n-3} = \frac{-3h}{8} f_{n-3}$$

$$* \int_0^h \frac{t'(t' + 3h)(t' + h)}{2h^3} \, dt' \, f_{n-2} = \frac{37h}{24} f_{n-2}$$

$$* \int_0^h \frac{t'(t' + 3h)(t' + 2h)}{-2h^3} \, dt' \, f_{n-1} = \frac{-59h}{24} f_{n-1}$$

$$* \int_0^h \frac{(t' + 3h)(t' + 2h)(t' + h)}{6h^3} \, dt' \, f_n = \frac{55h}{24} f_n$$

$$y_{n+1} = y_n + \frac{h}{24}\left(55 f_n - 59 f_{n-1} + 37 f_{n-2} - 9 f_{n-3}\right)$$

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