Math330

Assignment #6 Short Key

2nd semester 2018/2019 — Mahmoud Ghannam

(Q1) (a) 5

(b) Not possible.

(c) Not possible.

(d) 5

(Q2) (a) Take $t_0 = x_0 - h$, $t_1 = x_0$, $t_2 = x_0 + 3h$

$f(t) = P_2(t) + E_2(t)$, where $P_2(t)$ is Newton's polynomial

$f''(x_0) = f''(t_1) = P_2''(t_1) + E_2''(t_1)$. Continue, you'd get the formula.

(b) Take $t_0 = x_0 - h$, $t_1 = x_0$, $t_2 = x_0 + 3h$

$f(t) = P_2(t) + E_2(t)$, where $P_2(t)$ is Lagrange's polynomial

$f''(x_0) = f''(t_1) = P_2''(t_1) + E_2''(t_1)$. Continue, you'd get the formula.

(c) $f_{-1} = \cdots$

$3f_{-1} = \cdots$

$f_3 = \cdots$

$3f_{-1} + f_3 = \cdots$ Continue, you'd get the formula.

(Q3) (a) Take $t_0 = x_0 - 4h$, $t_1 = x_0 + h$

$f(t) = P_1(t) + E_1(t)$, where $P_1(t)$ is Newton's polynomial

$f'(x_0) = P_1'(x_0) + E_1'(x_0)$. Continue, you'd get the formula: $f'(x_0) = \dfrac{f_1 - f_{-4}}{5h} + \dfrac{3hf''(c)}{2}$

(b) Take $t_0 = x_0 - 4h$, $t_1 = x_0 + h$

$f(t) = P_1(t) + E_1(t)$, where $P_1(t)$ is Lagrange's polynomial

$f'(x_0) = P_1'(x_0) + E_1'(x_0)$. Continue, you'd get the formula: $f'(x_0) = \dfrac{f_1 - f_{-4}}{5h} + \dfrac{3hf''(c)}{2}$

(c) $f_1 = \cdots$

$f_{-4} = \cdots$

$f_1 - f_{-4} = \cdots$ Continue, you'd get the formula: $f'(x_0) = \dfrac{f_1 - f_{-4}}{5h} + \dfrac{3hf''(c)}{2}$

(Q4) $A = 6$, $B = 15$

(Q5) Optimal $h = 0.121951859$

(Q6) (a) + (b) + (c) Try!

(d) $h = \left(\dfrac{\epsilon}{4M}\right)^{1/3}$

(e) $f'(4.4) \approx 3.325$