1 ITEy4V3V3J;R$NFs<!@:EY:9J,

K\%I%-%e%a%s%HGO, NumRu::Derivative $GDj5A$5lk threepoints_O2nd_deriv $GMQ$$$kITEy4V3V3J;R$NFs<!@:EY:9J,$K$D$$$F$^$Hak. 3N:9J,$O6KC<$KITEy4V3VGO$J$$%G!<%?KBP7$FFs<!@:EY$N:9J,$rM?$(kbNG$"$k.

:#, 4X?t $f(x)$ $r, ?tNs $x_n(x_0, x_1, ..., x_i, ..., x_n)$ >e$KN%;6=$9$k.

$$f_i \equiv f(x_i) \tag{1.1}$$

$$t \equiv (x_{i+1} - x_i) \tag{1.2}$$

$$s \equiv (x_i - x_{i-1}) \tag{1.3}$$

$3$3$G, s Ht O[$\F1$8%*!<%@!<NCMG$"$k>l9g$rA[Dj7F5DO@$r?Jak.

$3$3$G, $f(x)$ $r3F3J;RE@6aK5$K$F%F%$%i!<E83+9k.

$$f(x_{i+1}) - f(x_i) = tf'(x_i) + \frac{t^2}{2}f''(x_i) + O(t^3) \tag{1.4}$$

$$f(x_{i-1}) - f(x_i) = -sf'(x_i) + \frac{s^2}{2}f''(x_i) + O(s^3) \tag{1.5}$$

$3$3$G, $f'(x_i), f''(x_i)$ O=l>lx_i$ K*1kf Nx $K4X$9$k0l3,$*hSFs3,$NHyJ,9', $O(t^3)$ Ot^3$ $N%*!<%@!<$NCM$rI=$9. N><0$+$if''$N9'$r>C5n9k$?$a$K, $s^2\times$(1.4) - $t^2\times$(1.5) $r7W;;$9kH,

$$s^2 f_{i+1} + (t^2 - s^2)f_i - t^2 f_{i-1} = (s^2 + st^2)f'(x_i) + s^2 O(t^3) + t^2 O(s^3) \tag{1.6}$$

HJ$k. >e<0$rJQ7A7F

$$\frac{s^2 f_{i+1} + (t^2 - s^2)f_i - t^2 f_{i-1}}{st(s+t)} = f'(x_i) + \frac{O(s^2t^3) + O(t^2s^3)}{st(s+t)} \tag{1.7}$$

$$= O(t^2). \tag{1.8}$$

3lhj, 2<!@:EY:9J,$N8x<0$O

$$f'(x_i) = \frac{s^2 f_{i+1} + (t^2 - s^2)f_i - t^2 f_{i-1}}{st(s+t)} \tag{1.9}$$

$H=q$/3H$,$G$-$k.