P223 6.1 1. $f(x)=\ln x$ $f'(x)=\frac{1}{x}$ $f'(1)=1$

(a) $f'(1)=\frac{f(1.1)-f(1)}{0.1}=\frac{\ln 1.1}{0.1}=0.953101$ $e=|1-0.953101|=0.046898$

(b) $f'(1)=\frac{f(1.01)-f(1)}{0.01}=\frac{\ln 1.01}{0.01}=0.995033$ $e=|1-0.995033|=0.004967$

(c) $f'(1)=\frac{f(1.001)-f(1)}{0.001}=\frac{\ln 1.001}{0.001}=0.999500$ $e=|1-0.999500|=0.000500$

13. $f(x+3h)=f(x)+3hf'(x)+\frac{9h^2}{2}f''(x)+O(h^3)$

$f(x-h)=f(x)-hf'(x)+\frac{h^2}{2}f''(x)+O(h^3)$

$\Rightarrow f(x+3h)-9f(x-h)=-8f(x)+12hf'(x)+O(h^3)$

13 $\Rightarrow f'(x)=\frac{f(x+3h)+8f(x)-9f(x-h)}{12h}+O(h^2)$

14. (a) $F(x)=\frac{4f(h/2)-f(h)}{4-1}=\left[4\frac{f(x+\frac{3}{2}h)+8f(x)-9f(x-\frac{h}{2})}{6h}\right.$

$\left.-\frac{f(x+3h)+8f(x)-9f(x-h)}{12h}\right]/3=\frac{-f(x+3h)+8f(x+\frac{3}{2}h)+56f(x)-72f(x-\frac{h}{2})+9f(x-h)}{36h}$