$$D_{\frac{h}{3}} = f^{(1)}(x) + \frac{f^{(3)}(x)}{3!}\left(\frac{h}{3}\right)^2 + \frac{f^{(5)}(x)}{5!}\left(\frac{h}{3}\right)^4 + O(h^6)$$

$$= f'(x) + f'''(x)\frac{h^2}{54} + f^{(5)}(x)\frac{h^4}{9720} + O(h^6)$$

Now

$$3^2 D_{h/3} - D_h = 3^2 f'(x) - f'(x) + \frac{f^{(5)}(x)}{5!} \times h^4\left(\frac{1}{81} \times 3^2\right) - \frac{f^{(5)}(x)}{5!}h^4 + O(h^6)$$

$$\frac{3^2 D_{h/3} - D_h}{3^2 - 1} = f'(x) + \frac{\left(\frac{1}{3^2} - 1\right)}{(3^2-1)5!} f^{(5)}(x)h^4 + O(h^6)$$

$$\therefore D_h^{(1)} = \frac{3^2 D_{h/3} - D_h}{3^2 - 1}$$

$$= \frac{9D_{h/3} - D_h}{8} \quad \text{(Ans)}$$

5.) $f(-6) = (-6)^3 + 5(-6)^2 - 4(-6) + 7$

$= -5$

and, $f(7) = (+7)^3 + 5(+7)^2 - 4(+7) + 7$

$= 567$

We can see the function of x goes from ~~positi~~ negative to positive in the range $[-6, 7]$.

6.) Here, $a = -6$, $b = 7$, $\delta = 10^{-16}$

$$\therefore n \geq \frac{\log(|7+6|) - \log(\delta)}{\log(2)} - 1$$

$\therefore n \geq 56$ iterations

(Ans.) 56 iterations