

$$\begin{aligned}
 (2+h)^3 &= f(x) = x^3 - 3x^2 + 4 \\
 & \quad \begin{array}{cccc} & & 1 & 1 \\ & & 1 & 2 & 1 \\ & 1 & 3 & 3 & 1 \end{array} \\
 & 2^3 + 3(2)^2h + 3(2)(h^2) + h^3 \\
 & = 8 + 12h + 6h^2 + h^3 \\
 \frac{f(2+h) - f(2)}{h} &= \frac{(2+h)^3 - 3(2+h)^2 + 4 - 0}{h} \\
 &= \frac{8 + 12h + 6h^2 + h^3 - 3(2^2 + 2 \cdot 2h + h^2) + 4}{h} \\
 &= \frac{8 + 12h + 6h^2 + h^3 - 3(4 + 4h + h^2) + 4}{h} \\
 &= \frac{8 + 12h + 6h^2 + h^3 - 12 - 12h - 3h^2 + 4}{h} \\
 &= \frac{\cancel{12h} + 6h^2 + h^3 - \cancel{12h} - 3h^2}{h} \quad h \rightarrow 0 \rightarrow 0
 \end{aligned}$$

$$\begin{aligned}
 &= \\
 & f(x) = x^3 - 3x^2 + 4 \\
 & f'(x) = 3x^2 - 6x \quad \rightarrow \\
 & f'(2) = 3(4) - 12 = 0 \quad \checkmark
 \end{aligned}$$