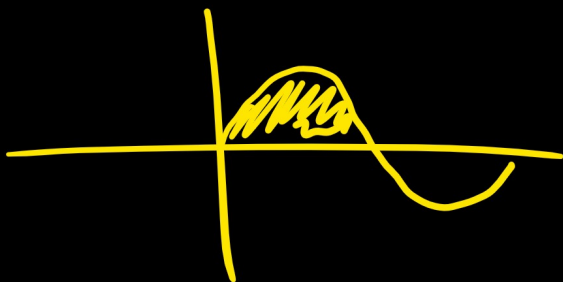


$$\begin{aligned} \underline{\text{ex:}} \quad (x+3)^5 &= 1x^5 \cdot 3^0 + 5x^4 \cdot 3^1 + 10x^3 \cdot 3^2 + 10x^2 \cdot 3^3 + 5x^1 \cdot 3^4 + 1x^0 \cdot 3^5 \\ &= x^5 \cdot 1 + 5x^4 \cdot 3 + 10x^3 \cdot 9 + 10x^2 \cdot 27 + 5x \cdot 81 + 1 \cdot 243 \\ &= x^5 + 15x^4 + 90x^3 + 270x^2 + 405x + 243 \end{aligned}$$

$$\begin{aligned} \underline{\text{ex:}} \quad (x^2 - 3y)^6 &= (x^2 + (-3y))^6 \\ &= 1(x^2)^6(-3y)^0 + 6(x^2)^5(-3y)^1 + 15(x^2)^4(-3y)^2 + 20(x^2)^3(-3y)^3 + 15(x^2)^2(-3y)^4 + 6(x^2)^1(-3y)^5 + 1(x^2)^0(-3y)^6 \\ &= x^{12} + 6x^{10}(-3y) + 15x^8 \cdot 9y^2 + 20x^6(-27y^3) + 15x^4 \cdot 81y^4 + 6x^2(-243y^5) + 729y^6 \\ &= x^{12} - 18x^{10}y + 135x^8y^2 - 540x^6y^3 + 1215x^4y^4 - 1458x^2y^5 + 729y^6 \end{aligned}$$

$$\begin{aligned} \text{Suppose } f(x) &= x^4 & f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \\ & & &= \lim_{h \rightarrow 0} \frac{(x+h)^4 - x^4}{h} \\ & & &= \lim_{h \rightarrow 0} \frac{\cancel{x^4} + 4x^3h + 6x^2h^2 + 4xh^3 + h^4 - \cancel{x^4}}{h} \\ & & &= 4x^3 \end{aligned}$$



Assignment: Use binomial theorem to expand:

1) $(x-4)^3$

2) $(x+3y)^4$

3) $(x-5)^6$