

WARMUP

Fill in the blanks:

1, 3, 5, 7, 9, 11

81, 71, 62, 54, 47, 41, 36

1, 2, 4, 8, 16, 32

1, 1, 2, 3, 5, 8, 13

0, T, T, F, F, S, S

T, N, E, S, S, F, F

M, V, E, M, J, S, U, N

Binomial Theorem

$$(3x+4)^3 = (3x+4)(3x+4)(3x+4)$$

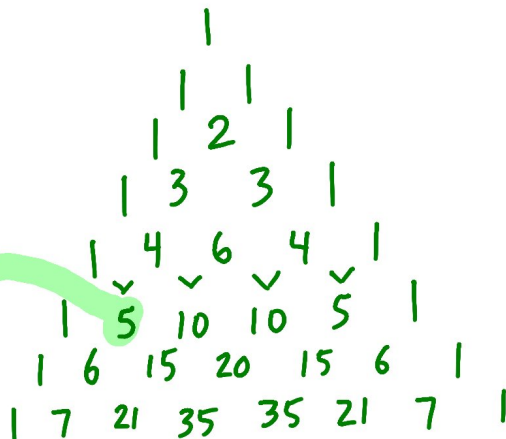
$$= (3x+4)(9x^2+24x+16)$$

$$= 27x^3 + 72x^2 + 48x + 36x^2 + 96x + 64$$

$$= 27x^3 + 108x^2 + 144x + 64$$

$$(x+3)^5 \neq x^5 + 3^5$$

Pascal's Triangle



$$\text{ex: } (x+3)^5 = 1x^5 \cdot 3^0 + 5x^4 \cdot 3^1 + 10x^3 \cdot 3^2 + 10x^2 \cdot 3^3 + 5x \cdot 3^4 + 1x^0 \cdot 3^5$$

$$= x^5 + 15x^4 + 90x^3 + 270x^2 + 405x + 243$$

$$\text{ex: } (x^2 - 3y)^6 = (x^2 + (-3y))^6$$

$$= 1(x^2)^6 + 6(x^2)^5(-3y)^1 + 15(x^2)^4(-3y)^2 + 20(x^2)^3(-3y)^3 + 15(x^2)^2(-3y)^4 + 6(x^2)^1(-3y)^5 + 1(-3y)^6$$

$$= x^{12} + 6x^{10}(-3y) + 15x^8 \cdot 9y^2 + 20x^6(-27y^3) + 15x^4 \cdot 81y^4 + 6x^2(-243y^5) + 729y^6$$

$$= x^{12} - 18x^{10}y + 135x^8y^2 - 540x^6y^3 + 1215x^4y^4 - 1458x^2y^5 + 729y^6$$

Suppose $f(x) = x^4$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

Find $f'(x) = 4x^3$

$$= \lim_{h \rightarrow 0} \frac{(x+h)^4 - x^4}{h}$$

If $f(x) = x^n$ then $f'(x) = nx^{n-1}$

$$= \lim_{h \rightarrow 0} \frac{x^4 + 4x^3h + 6x^2h^2 + 4xh^3 + h^4 - x^4}{h}$$

$$= \lim_{h \rightarrow 0} \frac{h(4x^3 + 6x^2h + 4xh^2 + h^3)}{h}$$

$$= 4x^3$$

Use binomial theorem to expand:

1) $(x-4)^3$

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

3) $(x-5)^6$