WARMUP

Fill in the blanks:

1, 3, 5, 7, <u>9</u>, <u>11</u>

81, 71, 62, 54, 47, <u>41</u>, <u>36</u>

1, 2, 4, 8, <u>16</u>, <u>32</u>

1, 1, 2, 3, 5, <u>8</u>, <u>13</u>

O, T, T, F, F, <u>S</u>, <u>S</u>

T, N, E, S, S, <u>F</u>, <u>F</u>

M, V, E, M, J, <u>S</u>, <u>U</u>, <u>N</u>

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

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

1 6 15 20 15 6 1

1 7 21 35 35 21 7 1

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

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

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 $f(x) = x^4$

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

$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

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

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

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

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

$$= 4x^3$$

Use binomial theorem to expand:

1) $(x-4)^3$

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

3) $(x-5)^6$