WARMUP

Expand:

1) $(x-5)^2 = (x-5)(x-5) = x^2 - 5x - 5x + 25 = x^2 - 10x + 25$

2) $(x+1)^3 = (x+1)(x+1)(x+1) = (x+1)(x^2+2x+1)$

$= x^3 + 2x^2 + x + x^2 + 2x + 1$

$= x^3 + 3x^2 + 3x + 1$

3) $(x+3)^4$

$= (x+3)^2(x+3)^2$

$= (x^2+6x+9)(x^2+6x+9)$

$= x^4 + 6x^3 + 9x^2 + 6x^3 + 36x^2 + 54x + 9x^2 + 54x + 81$

$= x^4 + 12x^3 + 54x^2 + 108x + 81$

Section 11.5 Binomia Theorem

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
1 8 28 56 70 56 28 8 1
1 9 36 84 126 126 84 36 9 1

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

$$= x^5\cdot 1 + 5x^4\cdot 3 + 10x^3\cdot 9 + 10x^2\cdot 27 + 5x\cdot 81 + 1\cdot 243$$

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

ex: $(x^2-3y)^6 = (x^2+(-3y))^6$

$$= 1(x^2)^6(-3y)^0 + 6(x^2)^5(-3y)^1 + 15(x^2)^4(-3y)^2 + 20(x^2)^3(-3y)^3 + 15(x^2)^2(-3y)^4 + 6(x^2)^1(-3y)^5 + 1(x^2)^0(-3y)^6$$

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

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

Suppose $f(x) = x^4$ $\qquad f'(x) = \lim\limits_{h\to 0} \dfrac{f(x+h)-f(x)}{h}$

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

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

$$= 4x^3$$

Assignment: Use binomial theorem to expand:

1) $(x-4)^3$

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

3) $(x-5)^6$