Section 11.7: The Binomial Theorem

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10:58 AM

suppose you were asked to expand $(x+y)^8$

- the hard way: FOIL it all
- the easy way: technology
- the way we're going to do it
  Pascal's triangle

$$(x+y)^8 = x^8 + \underline{8}\,x^7y + \underline{28}\,x^6y^2 + \underline{56}\,x^5y^3 + \underline{70}\,x^4y^4 + \underline{56}\,x^3y^5 + \underline{28}\,x^2y^6 + \underline{8}\,xy^7 + y^8$$

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

$$(m+2)^5 = m^5 + \underline{5}\,m^4(2) + \underline{10}\,m^3 \cdot 2^2 + \underline{10}\,m^2 \cdot 2^3 + \underline{5}\,m \cdot 2^4 + 2^5$$

$$= m^5 + 10m^4 + 40m^3 + 80m^2 + 80m + 32$$

$$(m-2)^5 = m^5 - 10m^4 + 40m^3 - 80m^2 + 80m - 32$$

if it's a difference, then terms alternate in sign

$$(3p-1)^4 = (3p)^4 - 4(3p)^3 1 + 6(3p)^2 1^2 - 4(3p)^1 1^3 + 1^4$$

$$= 81p^4 - 108p^3 + 54p^2 - 12p + 1$$