14.2
Notes
Day 3

BINOMIAL THEOREM (PART 3)

OBJECTIVES: 1) Use Binomial Theorem find a particular term in a binomial expansion.
2) Use Binomial Theorem to find the coefficient of a term in a binomial expansion.

DEFINITION: THE RTH TERM OF AN EXPANSION

The rth term in the expansion of $(a+b)^n$ is: $\binom{n}{r-1}a^{n-r+1}b^{r-1}$

1) Find the 12th term in the expansion of $\left(x-x^2\right)^{18}$.

$\binom{18}{11}a^{18-11}b^{11}$

$\binom{18}{11}x^7(-x^2)^{11}$

$-\binom{18}{11}x^7x^{22} = \boxed{-31824x^{29}}$

2) Find the 5th term in the expansion of $\left(\sqrt{3}-1\right)^7$.

$\binom{7}{4}\sqrt{3}^3(-1)^4 = \binom{7}{4}(3\sqrt{3})(1) = 35(3\sqrt{3}) = \boxed{105\sqrt{3}}$

FINDING A COEFFICIENT OF A SPECIFIC TERM IN A BINOMIAL EXPANSION:

3) Find the coefficient of the term containing x^4 in the expansion of $\left(x+y^2\right)^{30}$.

$x^A(y^2)^B \Rightarrow A+B=30$

$A=4$ so $B=26$

$\binom{30}{26}x^4(y^2)^{26}$

$27{,}405\,x^4y^{52}$

Coefficient: 27,405

4) Find the coefficient of the term containing a^9 in the expansion of $\left(a+2\sqrt{a}\right)^{10}$.

$a^A(2a^{\frac{1}{2}})^B \Rightarrow$ $A+B=10$

$A+\frac{1}{2}B=9$

$\frac{1}{2}B=1$

$B=2$ so $A=8$

$\binom{10}{2}a^8(2\sqrt{a})^2$

$\binom{10}{2}a^8 \cdot 4a$

$45a^8 \cdot 4a$

$180a^9$

coefficient: 180

5) Find the coefficient of the term containing x^{13} in the expansion of $\left(x^2-\frac{2}{x}\right)^{11}$.

$(x^2)^A\left(-\frac{2}{x}\right)^B$ $A+B=11$

$2A-B=13$

$\binom{11}{3}(x^2)^8\left(-\frac{2}{x}\right)^3$

$3A=24$

$A=8$

$B=3$

$165x^{16} \cdot \frac{-8}{x^3}$

$-1320x^{13}$

coefficient: -1320