Advanced Algebra

Binomial Expansion Assignment #3

1) Use the binomial expansion of $(a+b)^3$ to expand and simplify. **($a^3+3a^2b+3ab^2+b^3$...you should know this expansion by memory)**

a) $(2+x)^3$

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

$8 + 12x + 6x + x^3$

b) $(3x-1)^3$

$a=3x$

$b=1$

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

$27x - 27x + 9x - 1$

c) $(2x+5)^3$ $8x^3 + 60x^2 + 150x + 125$

d) $(3x-\frac{1}{3})^3$

$a=3x$

$b=\frac{1}{3}$

$(3x)^3 - 3(3x)^2\frac{1}{3} + 3(3x)(\frac{1}{3})^2 + \frac{1}{27}$

$27x^3 - 9x^2 + x + \frac{1}{27}$

2) Use $(a+b)^4 = a^4+4a^3b+6a^2b^2+4ab^3+b^4$ to expand and simplify

a) $(1+2x)^4$

$a=1$

$b=2x$

$(1)^4 + 4(2x) + 6(2x)^2 + 4(2x)^3 + (2x)^4$

$1 + 8x + 24x^2 + 32x^3 + 16x$

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

$a=2x$

$b=3$

$(2x)^4 + 4(2x)^3 3 + 6(2x)^2 3^2 + 4(2x)3^3 + 3^4$

$16x^4 + 96x^3 + 216x^2 + 216x + 81$

c) $(x+\frac{1}{x})^4$

$a=x$

$b=\frac{1}{x}$

$(x)^4 + 4(x)^3\frac{1}{x} + 6x^2(\frac{1}{x})^2 + 4x(\frac{1}{x})^3 + \frac{1}{x^4}$

$x^4 + 4x^2 + 6 + \frac{4}{x^2} + \frac{1}{x^4}$

3) Find the 6th term of $(3x+2)^8$

$_8C_6(3x)^2 2^6$

$\frac{8!}{2!}$ $28 \times 9 \times 2^6$

Final answer for #3

$16128x^2$

4) Find the coefficient of a^3b^2 in the expansion of $(3a+b)^5$

Term 2 because b^2

so $_5C_2$ $\frac{5!}{3!2!}$

Final answer for #4

10

5) Find the coefficient of a^3b^3 in the expansion of $(2a+3b)^6$

I know that this means term 3

50

${}_6C_3$

$\frac{6!}{3!3!}$ $\frac{6\times5\times4}{6}$

Final answer for #5

${}_6C_3$ or 20

6) Write down the first 3 terms and the last 2 terms of the expansion of $(2x+\frac{1}{x})^{12}$

${}_{12}C_1(2x)^{11}\left(\frac{1}{x}\right) + {}_{12}C_2(2x)^{10}\left(\frac{1}{x}\right)^2 + {}_{12}C_3(2x)^9\left(\frac{1}{x}\right)^3$

12 66 220

$24576x^{10}$ $67584x^8$ $112640x^6$

Term 1 Term 2 Term 3

Final answer for #6

~~${}_{12}C_{11}$~~ $2x\left(\frac{1}{x}\right)^{11} + \left(\frac{1}{x}\right)^{12}$

12

$\frac{24}{x^{10}} + \frac{1}{x^{12}}$