Name: ___**Key**___

1. [**4 points**] Find the <u>numerical value</u> of the coefficient of $x^6 y^3$ in $(x+y)^9$.

$$C(9,3) = \frac{9!}{3! \cdot (9-3)!} = \frac{9!}{3! \cdot 6!} = \frac{9 \cdot 8 \cdot 7}{3 \cdot 2 \cdot 1}$$

$$= 3 \cdot 4 \cdot 7 = \boxed{84}$$

2. [**3 points**] Find the coefficient of x^4 in $(3x-1)^{11}$. You do not need to simplify your answer.

$$(A+B)^{11}; \quad A^4 B^7: \quad \text{term coef. is} \quad \frac{11!}{4! \cdot 7!} A^4 B^7$$

$$\underline{A = 3x, \ B = -1:} \quad \frac{11!}{4! \cdot 7!}(3x)^4 \cdot (-1)^7$$

$$= \boxed{-\frac{3^4 \cdot 11!}{4! \cdot 7!}} \cdot x^4$$

3. [**3 points**] Find the coefficient of $x^8 y^3$ in $(4x - 2y + 3)^{20}$. You do not need to simplify your answer.

$$(A+B+C)^{20}: \quad A^8 B^3 C^9 \text{ term is } \frac{20!}{8! \cdot 3! \cdot 9!} A^8 \cdot B^3 \cdot C^9$$

with $A = 4x$, $B = -2y$, $C = 3$:

$$\frac{20!}{8! \cdot 3! \cdot 9!}(4x)^8 \cdot (-2y)^3 \cdot (3)^9 = \boxed{-\frac{4^8 \cdot 2^3 \cdot 3^9 \cdot 20!}{8! \cdot 3! \cdot 9!}}$$