Name: _____

Directions: Show all work.

1. **[2 parts, 3 points each]** Binomial Theorem.

   (a) Use the binomial theorem to expand $(x^2+1)^n$.

   (b) Differentiate both sides of part (a) to find a formula for $\sum_{k=1}^{n} 2k\binom{n}{k}3^{2k-1}$.

2. **[4 points]** How many integer solutions are there to $x_1 + \ldots + x_8 = 50$ such that $0 \leq x_i \leq 5$ for each i? Use inclusion/exclusion to give a summation formula.