Mathematics 216
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Homework 15
Due February 29, 2012

1. Suppose that m and k are nonnegative integers. Prove that
$$\int_0^1 x^k(1-x)^m\,dx = \frac{m!k!}{(m+k+1)!}.$$

2. Prove or give a counterexample:
If A, B, and C are sets, then $A \cap (B \setminus C) = (A \cap B) \setminus (A \cap C)$.

3. Suppose that n and k are positive integers, with $k \geq 2$. Prove that
$$(k-1)\binom{nk-1}{n-1} = \binom{nk-1}{n}.$$