KING SAUD UNIVERSITY

Practice problems for final

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1. Express the number 442 (base 6) in base 3.

2. What is the co-efficient of $x^3y^4z^3$ when expanding $(x+2y+3z)^{10}$.

3. Calculate the value of $\sum_{k=0}^{n}\prod_{i=0}^{k} 3$.

4. Prove using Induction that for all positive integer *n*, then

$$\sum_{k=0}^{n} k\cdot(k!) = (n+1)!-1.$$

5. Use Induction to show that, $n! > 2^n$ for all $n \geq 4$.

6. Write the generating function in closed form to generate the infinite sequence: <5, 3, 1, 1, 1, ...>

7. Solve the recurrence relation $a_n = a_{n-1} - 3a_{n-2}$ with initial conditions $a_0 = 1, a_1 = 4$.

8. How many passwords of length 7 can you make using following symbols: a-z, A-Z, @, and 0-9. Each password must have at least one capital letter, and at least one digit.

9. Suppose we have three sets: *X*, *Y*, and *Z* of sizes n, m, ℓ respectively. Let set $W = X \times Y$ (cross-product of two sets), and let $E = P(W)$, that is the power set of *W*. Count the number of functions $f : Z \mapsto E$.