

Math 187 Test III, Math 187

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1. Compute the first six terms of the sequence defined by $a_0 = 4; a_1 = 7; a_{n+2} = 3a_{n+1} - 2a_n$.

Derive a closed form formula for the terms of this sequence: $a_n = \dots$

(extra credit) Prove that this formula works for all n by math induction.

2. For each of the following, state whether it is a function. If it is not a function, explain why not and stop.

If it is a function, state whether it is one-to-one. If it is not one-to-one, explain why not and stop.

If it is one-to-one, state its inverse.

(a) $\{(0, 3), (1, 2), (2, 1)\}$

(b) $f(x) = x^2 - 1$

(c) $x^3 + y^3 = 1, x, y$ real.

3. Counting functions

4. How many functions are there from a set of size 3 to a set of size 6?
How many of them are 1-to-1?

5. How many functions are there from a set of size 5 to a set of size 2?
How many of them are onto?

6. Permutations σ and τ are given, one in table form and one in disjoint cycle form. Compute σ^{-1} and $\sigma \circ \tau$, both in disjoint cycle form.

$$\sigma = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 2 & 6 & 1 & 5 \end{bmatrix}$$

$$\tau = (12)(3564)$$

7. Determine the gcd of 132 and 111 and numbers x and y such that $132x + 111y = \gcd(132, 111)$

8. Write out the multiplication table for mod 5 arithmetic.

Solve the equation

$$11x \equiv 2 \pmod{43}$$