Math 143

Examples of Functions

11-11-10

For each function in #1-8: Is the function one-to-one? Does it map onto its codomain? Does it have an inverse function? (If so, find the inverse.)

1. (Darrin) Let *X* be the set of all non-empty graphs *G* with | *V* (*G*) | ≤ 10. Let be the set of all positive integers. Define  by the rule:  (the chromatic number of *G*).
2. (Scott) Let *X* be the set of all non-empty graphs *G* with | *V* (*G*) | ≤ 10. Define  by the rule: .
3. (C.J.) Let *X* = {1, 2, 3, 4, 5}. Define  , *h* = {(1, 3), (2, 5), (3, 2), (4, 1), (5, 4)}.
4. (Dung) Let *X* = {1, 2, 3, 4, 5}. Define  ,   
   *j* = {(1, 1), (2, 3), (3, 3), (4, 2), (5, 4)}.
5. (Nathan) Define  by the rule .
6. (Tina) Define  by the rule .
7. (Colby) Define  by the rule .
8. (Adam) Define  by the rule .

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1. (Aaron) Let *X* = {1, 2, 3, 4, 5} and *Y* = {1, 2, 3, 4}.
   1. Count the total number of functions of type .
   2. How many functions from *X* to *Y* are one-to-one?
   3. How many functions from *X* to *Y* map onto *Y*?
   4. How many functions from *X* to *Y* are bijections?
2. (Moana) Let *X* = {1, 2, 3, 4, 5}.
   1. Count the total number of functions of type .
   2. How many functions from *X* to *X* are one-to-one?
   3. How many functions from *X* to *X* map onto *X*?
   4. How many functions from *X* to *X* are bijections?
3. Let *X* and *Y* be any sets.
   1. What must be true (about *X* and *Y*) in order for there to exist a one-to-one function?
   2. What must be true (about *X* and *Y*) in order for there to exist a surjective function ?
   3. What must be true (about *X* and *Y*) in order for there to exist a bijective function   
      ?