Name: ____________________

NetID: ____________________ **Lecture:** **B**

Discussion: **Friday** **11** **12** **1** **2** **3** **4**

1. (5 points) Suppose that $|A| = p$ and $|B| = q$, $p \leq q$. How many different one-to-one functions are there from A to B?

   Solution: $\frac{q!}{(q-p)!}$

2. (10 points) Check the (single) box that best characterizes each item.

If a function from $\mathbb{R}$ to $\mathbb{R}$ is increasing, it must be one-to-one.	true	☐	false	☑		
$f : \mathbb{N} \to \mathbb{R}$ $f(x) = x^2 + 2$	onto	☐	not onto	☑	not a function	☐
$f : \mathbb{N} \to \mathbb{N}$ $f(x) = 3 - x$	one-to-one	☐	not one-to-one	☐	not a function	☑
We painted 12 mailboxes. There were 5 colors to choose from and each mailbox is painted with a single color. By the pigeonhole principle, every color appears on at least two mailboxes.	true	☐	false	☑		
$\exists y \in \mathbb{N},\ \forall x \in \mathbb{N},\ x = xy$	true	☑	false	☐		

Name: ______________________________

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Discussion: Friday 11 12 1 2 3 4

1. (5 points) Suppose that $|A| = p$, $|B| = q$, $|C| = n$. How many different functions are there from A to $B \times C$?

   Solution: There are qn elements in $B \times C$. So there are $(qn)^p$ ways to build a function from A to $B \times C$.

2. (10 points) Check the (single) box that best characterizes each item.

If a function from $\mathbb{R}$ to $\mathbb{R}$ is strictly increasing, it must be one-to-one.	true ☑	false ☐	
$g : \mathbb{N} \to \mathbb{Z}$, $g(x) = \|x\|$	one-to-one ☑	not one-to-one ☐	not a function ☐
$g : \mathbb{R} \to \mathbb{R}$, $g(x) = \sin(x)$	onto ☐	not onto ☑	not a function ☐
We painted 12 mailboxes. There were 5 colors to choose from and each mailbox is painted with a single color. By the pigeonhole principle, there is a color that appears on at least two mailboxes.	true ☑	false ☐	
$\forall x \in \mathbb{Z},\ \exists y \in \mathbb{Z},\ x \neq y$ and $x + y = 0$	true ☐	false ☑	