MATH 140A Review: Mathematical Induction

Facts to Know:

To show that a statement holds for every $n = 1, 2, 3, \ldots$ follow the following steps of *mathematical induction*:

1. Identify   that needs to be proven for $n =$

2. **(basis step)** Prove that   holds for $n =$

3. **(induction step)**

   - Assume   holds for $n =$
   - Show that   holds for $n =$

If the basis and induction steps hold, then

Example: Show that $4 \mid (7^n - 3^n)$ for $n = 1, 2, 3, \ldots$.

1. We need to show that

$$4 \mid (7^n - 3^n)$$

   for $n = 1, 2, \ldots$.

2. **(basis step)** We need to show that

$$4 \mid (7^1 - 3^1).$$

3. **(induction step)**

   - Assume

$$4 \mid (7^k - 3^k)$$

   - We need to show

$$4 \mid (7^{k+1} - 3^{k+1})$$