

**Math 317 Section B1 Quiz 3**  
February 8, 2002

**Problem 1.**

Show that  $9^m + 9^n + 3$  cannot be a perfect square, if  $m, n \geq 1$  are integers.

**Solution**

We know that for an integer  $a$  we have  $a^2 \equiv 0, 1$  or  $4 \pmod{8}$ . However  $9 \equiv 1 \pmod{8}$  and hence  $9^k \equiv 1^k \equiv 1 \pmod{8}$  for any integer  $k \geq 1$ . Hence

$$9^m + 9^n + 3 \equiv 1 + 1 + 3 \equiv 5 \pmod{8}.$$

Since  $5 \not\equiv 0, 1, 4 \pmod{8}$ , we conclude that  $9^m + 9^n + 3$  is not a perfect square.