- Now we shall try to show $2p^2+2p \neq 6q^2+9q+3$

$2p^2+2p \to 2p(p+1)$

$6q^2+9q+3 \to 3(2q^2+3q+1)$
$3(q+1)(2q+1)$

New way (Deserves a better idea)

$a^2=8+3b^2$. By div algo, b can be $8K, 8K+1, \ldots\ldots, 8K+7$ for some $K \in N$

- $b=8K$, $8+3b^2 = 8+192K^2 = 8(1+24K^2) = 8(2(12K^2)+1)$ $\to$ not divisible by 2

~~Again by div algo, K can be 2p or 2p+1, ...~~

~~$K=2p$, $24K^2+1 = 96p^2+$~~ $\therefore 8+3b^2$ can't be a perfect square

- $b=8K+1$, $8+3b^2 = 8+3(8K+1)^2 = 8+3(64K^2+16K+1) = 192K^2+48K+8+3$
$= 4(48K^2+12K+2)+3$

$a = 4p, 4p+1, 4p+2$ or $4p+3$ for some $p \in N$.
$a^2 = 16p^2$, $16p^2+8p+1 = 4(4p^2+2p)+1$, $16p^2+16p+4 = 4(4p^2+4p+1)$,
$16p^2+24p+9 = 4(4p^2+6p+2)+1$ $\therefore a^2 \neq 8+3b^2$ for this case

- $b=8K+2$ $\quad 8+3b^2 = 8+3(64K^2+4+32K) = 8+192K^2+12+96K$
$= 192K^2+96K+20$

$= 4(48K^2+2K+5)$

- We shall try to show $48K^2+2K+5$ is not divisible by 4

$K = 2K_1$ or $2K_1+1$ for some $K_1 \in N$. (Div algo)

$K=2K_1$, $48K^2+2K+5 = 192K_1^2+4K_1+5 = 4(48K_1^2+K_1+1)+1$

$K=2K_1+1$, $48K^2+2K+5 = 48(4K_1^2+4K_1+1)+2(2K_1+1)+5$
$= 4(48K_1^2+49K_1+13)+3$

$\therefore 4 \nmid (48K^2+2K+5)$

- $b=8K+3$ $\quad 8+3b^2 = 8+3(8K+3)^2 = 8+3(64K^2+48K+9)$
$= 4(48K^2+36K+8)+3$

$\therefore a^2 \neq 8+3b^2$ here