Calculate 3^{33} mod 5.

Solution 1 using fast powering:

$$3^{33} \equiv 3 \cdot 3^{32} = 3 \cdot 9^{16} \equiv 3 \cdot (-1)^{16} = 3 \cdot 1^8 = 3 \pmod 5.$$

Solution 2 using Fermat's little theorem: As $3^5 \equiv 3 \pmod 5$, $3^4 \equiv 1 \pmod 5$ so

$$3^{33} \equiv 3^{4 \cdot 8 + 1} = 3 \cdot (3^4)^8 \equiv 3 \cdot 1^8 = 3 \pmod 5.$$