6. (2 pts) Show that 7.2121212121... is a rational number.

$7 + .2121212121$

$x = .2121212121$

$100x - x = 21$

$100x - x = 99x$

$99x = 21$

$x = \frac{21}{99}$

$7 + \frac{21}{99}$ = rational number

J2C

10. (5 pts)Prove that if n is any integer that is not divisible by 2 or 3, then $n^2$ mod 12 = 1.

Let n be any integer that is not divisible by 2 or 3

Case 1: n is not divisible by 2

def. of divisibility → $n = 2q + r$ for some integers q and r and $0 \le r < 2$ of

→ $n^2 = 12q + 1 = n^2 \bmod 12 = 1$ J2C

$2q + r = 12q + 1$

$r = 10q + 1$

since $r > 1$ then $n^2 \bmod 12 \neq 1$

Case 2: n is not divisible by 3

$n = 3q + r$ for some integers q and r and $0 \le r < 3$

def. of divisibility

$n^2 = 12q + 1$ J2C

$3q + r = 12q + 1$

$r = 9q + 1$

therefore $r > 1$ then $n^2 \bmod 12 = 1$

Case 3: n is divisible by 2

$n = 2q + 0$

$n^2 = 12q + 1$

$2q = 12q + 1$