(3.1) a)

↳ $49 - 3 \cdot 15 = 4$

i) $7^2 = 49 \equiv 4 \bmod 15$

$7^4 = (7^2)^2 \equiv 4^2 \bmod 15 = 16 \bmod 15 = -1 \bmod 15$

$7^8 = (7^4)^2 \equiv (-1)^2 \bmod 15 \equiv 1 \bmod 15$

$7^{16} = (7^8)^2 \equiv \boxed{1 \bmod 15}$

...

$7^{50} = 7^{32} \cdot 7^{16} \cdot 7^2 = 1 \cdot 1 \cdot 4 \bmod 15 = 4 \bmod 15$

↳ $64 - 7 \cdot 9 = 1$

ii) $8^2 = 64 \equiv 1 \bmod 9$

...

$8^{2020} = 8^{1024} \cdot 8^{512} \cdot 8^{256} \cdot 8^{128} \cdot 8^{64} \cdot 8^{32} \cdot 8^4 =$

$\equiv \boxed{1 \bmod 9}$

↳ $100 - 3 \cdot 35 = -5$

iii) $10^2 = 100 \equiv -5 \bmod 35$

$10^4 = (10^2)^2 \equiv 25 \bmod 35 = -10 \bmod 35$

$10^8 = (10^4)^2 \equiv 100 \bmod 35 = \boxed{-5 \bmod 35}$

b)

$\boxed{n = 15}$ $\phi(15) = \phi(5 \times 3) = \phi(5) \times \phi(3) = 4 \times 2 = (8)$

$\boxed{n = 35}$ $\phi(35) = \phi(5 \times 7) = \phi(5) \times \phi(7) = 4 \times 6 = (24)$

$\boxed{n = 9}$ $\phi(9) = (8)$

c)

↳ calculado em b)

i) $7^{-1} = 7^{\phi(15)-1} \bmod 15 = 7^7 \bmod 15 = \boxed{13 \bmod 15}$

ii) $8^{-1} = 8^{\phi(9)-1} \bmod 9 = 8^7 \bmod 9 = \boxed{8 \bmod 9}$

iii) $34^{-1} = 34^{\phi(35)-1} \bmod 35 = 34^{23} \bmod 35 = \boxed{34 \bmod 35}$

iv) $7^{-50} = (7^{50})^{-1} = (7^{50})^{\phi(15)-1} \bmod 15 =$

$= (7^{50})^7 \bmod 15 = \boxed{4 \bmod 15}$

v) $8^{-2019} = (8^{2019})^{-1} = (8^{2019})^{\phi(9)-1} \bmod 9 =$

$= (8^{2019})^7 \bmod 9 = \boxed{8 \bmod 9}$