Single Choice 7

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1. Which of the following rings is not isomorphic to the others?

   (a) $\mathbb{F}_3[X]/(X^2 + X + 2)$

   (b) $\mathbb{F}_3[X]/(X^2 + 2X + 2)$

   (c) $\mathbb{F}_3[X]/(X^2 + X + 1)$

   (d) $\mathbb{F}_9$

2. How many irreducible factors does the polynomial $X^9 - X$ have over $\mathbb{F}_3$?

   (a) 2

   (b) 4

   (c) 6

   (d) 9

3. Which of the following elements is a generator of $\mathbb{F}_{19}^{\times}$

   (a) $\overline{1}$

   (b) $\overline{3}$

   (c) $\overline{7}$

   (d) $\overline{9}$

4. Let p be a prime number. Which of the following statements are false?

   (a) There exists a field of order p^p.

   (b) If $F : \mathbb{F}_{p^p}$ is a finite field extension, then $F : \mathbb{F}_{p^p}$ is simple.

   (c) The unit group $\overline{\mathbb{F}}_p^{\times}$ is cyclic.

   (d) If a field F is a splitting field of $X^{p^p} - X \in \mathbb{F}_p[X]$ over $\mathbb{F}_p$, then F has p^p elements.

5. How many irreducible polynomials of degree 2 are there over $\mathbb{F}_2$?

   (a) 1

   (b) 2

   (c) 3

   (d) 4