

## Problem

Let  $J_5 = \{0, 1, 2, 3, 4\}$ , and define a function  $F: J_5 \rightarrow J_5$  as follows: For each  $x \in J_5$ ,  $F(x) = (x^3 + 2x + 4) \bmod 5$ . Find the following:

a.  $F(0)$

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b.  $F(1)$

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c.  $F(2)$

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d.  $F(3)$

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e.  $F(4)$

## Step-by-step solution

## Step 1 of 5

(a) To find  $F(0)$

Put  $x = 0$  in  $F(x) = (x^3 + 2x + 4) \bmod 5$

$$\begin{aligned} F(0) &= (0 + 2 \cdot 0 + 4) \bmod 5 \\ &= 4 \end{aligned}$$

## Step 2 of 5

(b) To find  $F(1)$  put  $x = 1$  in  $F(x) = (x^3 + 2x + 4) \bmod 5$

$$\begin{aligned} F(1) &= (1 + 2 + 4) \bmod 5 \\ &= 2 \end{aligned}$$

## Step 3 of 5

(c)  $F(2) = (2^3 + 2 \cdot 2 + 4) \bmod 5$

$$\begin{aligned} &= (8 + 4 + 4) \bmod 5 \\ &= 16 \bmod 5 \\ &= 1 \end{aligned}$$

## Step 4 of 5

(d)  $F(3) = (3^3 + 2 \cdot 3 + 4) \bmod 5$

$$\begin{aligned} &= (27 + 6 + 4) \bmod 5 \\ &= 37 \bmod 5 \\ &= 2 \end{aligned}$$

## Step 5 of 5

$$(e) F(4) = (4^3 + 2 \cdot 4 + 4) \bmod 5$$

$$= (64 + 8 + 4) \bmod 5$$

$$= 76 \bmod 5$$

$$= 1$$