ELIXIIT ACADEMY
— The Toppers' Point

FUNCTIONS EXERCISE→ I

OBJECTIVE QUESTIONS

1. Let f: $[1, \infty) \rightarrow [-1, \infty)$ be given by $f(x) = (x+1)^2 - 1$ and $S = \{x: f(x) = f^{-1}(x)\}$. Then, S=

(a) $\{-1, 0\}$ (b) $\{-1, 0, 1\}$

(c) $\left\{-1, 0, \frac{1+i\sqrt{3}}{2}, \frac{1-i\sqrt{3}}{2}\right\}$ (d) $\left\{-1, \frac{-1+i\sqrt{3}}{2}, \frac{-1-i\sqrt{3}}{2}\right\}$

2. Let the function $f: R \rightarrow R$ be defined by $f(x) = 2x + \sin x$. Then, f is

(a) one-to one and onto (b) one-to one but not onto

(c) onto but not one-to-one (d) neither one to one nor onto

3. The period of the function

$f(x) = \sin x + \tan\frac{x}{2} + \sin\frac{x}{2^2} + \tan\frac{x}{2^3} + \cdots + \sin\frac{x}{2^{n-1}} + \tan\frac{x}{2^n}$, is

(a) 2π (b) $2^{n-1}\pi$ (c) $2^n\pi$ (d) $n\pi$

4. The domain of the definition of the function f(x) given by

$3^x + 3^{f(x)} = \min\{2t^3 - 15t^2 + 36t - 25,\ \ 2 + |\sin t|;\ \ 2 \le t \le 4$ is

(a) $(-\infty, 1)$ (b) $(-\infty, \log_3 e)$ (c) $(-\infty, \log_3 2)$ (d) $(-\infty, \log_3 2)$

5. The period of the function

$$f(x) = 4\sin^4\left(\frac{4x-3\pi}{6\pi^2}\right) + 2\cos\left(\frac{4x-3\pi}{6\pi^2}\right) \text{ is}$$

(a) $\frac{3\pi^2}{4}$ (b) $\frac{3\pi^3}{4}$ (c) $\frac{4\pi^2}{3}$ (d) $\frac{4\pi^3}{3}$

SUBJECTIVE TYPE QUESTIONS

1. Find the range of the function $f(x) = \log_2 \frac{\sin x - \cos x + 3\sqrt{2}}{\sqrt{2}}$

2. Find the domain of the function $f(x) = \log_{(2x-5)}(x^2 - 3x - 10)$

3. For $x \geq 0$ define

$$f(x) = \frac{1}{x + 2\cos x}$$

Determine the set $\{y \in R: y = f(x), x \geq 0\}$

4. Let R denote the set of real numbers. Suppose a function $f: R \to R$ satisfies f(f(f(x)))=x, for all $x \in R$. Show that

(a) f is one-to one

(b) f cannot be strictly decreasing, and

(c) if f is strictly increasing, then f(x)=x for all x ∈ R.