1)

$$\left.\begin{array}{l} xy = z+4 \\ zx = y+6 \\ z = 5-y \end{array}\right\} \Rightarrow \; x = ?$$

A) 1 B) 2 C) 3

D) 4 E) 5

2)

$a \in \mathbb{R},\ i = \sqrt{-1},$

$(2-i)(a-i) = (a+i)(2+i)$

$\Rightarrow \; a = ?$

A) 2 B) 1 C) 0

D) -1 E) -2

3)

$\log_6 12 = x \;\Rightarrow\; \log_{12} 24 = ?$

A) $\dfrac{3x-1}{2x-1}$ B) $\dfrac{x-2}{x}$ C) $\dfrac{x+1}{x}$

D) $\dfrac{2x-1}{x}$ E) $\dfrac{2x-1}{x+1}$

4)

$P(x-2) - P(2-x) = ax^2 - bx + 12$

$a+b = ?$

A) -4 B) -2 C) 3

D) 5 E) 6

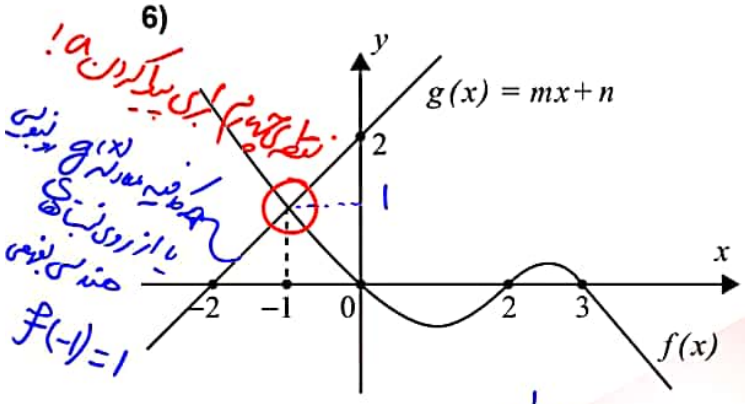
5)

$$\frac{0,6 + \dfrac{0,08}{0,2}}{0,8 - \dfrac{0,06}{0,2}} = ?$$

A) 3 B) 2 C) $\dfrac{3}{2}$

D) 1 E) $\dfrac{1}{2}$

6)



$f(x) = ax^3 + bx^2 + cx + d$

$f(12) = ?$

A) -60 B) -72 C) -84

D) -90 E) -96

7)

$i = \sqrt{-1} \Rightarrow (1+i^3-i^5)^2 - (1-i^3-i^7)^3 = ?$

A) $1-i$ B) $1-3i$ C) $-1-5i$

D) $-3-3i$ E) $-3-5i$

8)

$$A = \frac{\sqrt{15}}{3} - \sqrt{9-\frac{1}{9}} + \frac{\sqrt{405}}{27}$$

$\frac{3A}{\sqrt{5}} = ?$

A) $\sqrt{3}-3$ B) $1-\sqrt{3}$ C) $\sqrt{3}-\sqrt{5}$

D) $\sqrt{3}-1$ E) $2\sqrt{3}$

9)

$$A = \frac{3}{3+\frac{1}{7}}, \quad B = \frac{3}{1-A} \Rightarrow A \cdot B = ?$$

A) 42 B) 44 C) 52

D) 63 E) 66

10)

$$\frac{x^2-16y^2}{x^2+y^2}\cdot\left(\frac{4x-y}{x^2+4xy}+\frac{4x+y}{x^2-4xy}\right)=?$$

A) $\frac{8}{x}$ B) $\frac{8}{y}$ C) $\frac{8}{xy}$

D) $\frac{4x-y}{x^2-xy}$ E) $\frac{4x-y}{x^2+xy}$

11)

$$\left.\begin{aligned}13x+14y&=36\\14x+15y&=39\end{aligned}\right\}\Rightarrow x=?$$

A) -3 B) -1 C) 1 D) 3 E) 6

12)

$$\frac{0,001+0,011}{0,0111}+\frac{0,03(44,4-23,1)}{0,3+0,033}=?$$

A) 1 B) 2 C) 3 D) 4 E) 5

13)

$$\frac{a^2b-3a^2-3a+ab-2b+6}{ab^2+2b^2-10b-5ab+6a+12}+\frac{1}{b-2}=?$$

A) $\frac{a-1}{b-2}$ B) $\frac{a}{b-2}$ C) $\frac{a+1}{b+2}$ D) $\frac{1}{b+2}$ E) 1

14)

$$\left.\begin{aligned}x+2y+3z&=7\\x+3y&=5\\3y+4z&=7\end{aligned}\right\}\Rightarrow x+y+z=?$$

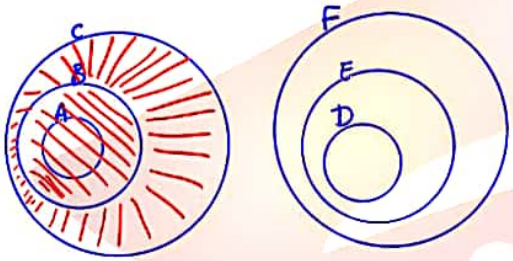
A) -15 B) -1 C) 0 D) 4 E) 10

15)

$A \subset B \subset C$
$D \subset E \subset F$
$\Rightarrow [(A \cup B) \cap (C \setminus B)] \cup [(D \setminus F) \cap (E \cap F)] = ?$

A) $\varnothing$ B) $C \cap E$ C) $B \cap F$

D) D E) E



16)

$f(x\sqrt{2}) = (a-1)x^2 + b$
$g(x\sqrt{3}) = (a+1)x^2 + c$
$f(0) = g(0) = 10$
$f(\sqrt{6}) = g(\sqrt{6})$
$\Rightarrow f(1) + g(1) = ?$

A) 8 B) 12 C) 16

D) 18 E) 24

17)

$P(x) = ax^3 + bx^2 + cx + d$
$P(-x) = -P(x)$
$P(1) = 5$
$P(x) + 52 = (x+2)Q(x)$
$P(-3) = ?$

A) -260 B) -190 C) -183

D) 183 E) 195

18)

$8^{x+1} = 125^y$
$25^x = 4^{y-1}$
$\Rightarrow x - y = ?$

A) -2 B) -1 C) 0

D) 1 E) 2

19)

$$\frac{a+b}{c+3}=\frac{b+2c}{6a-1}=1,$$

$a+b+c=19 \Rightarrow a=?$

$a+b=19-c$

$\frac{a+b}{c+3}=1 \rightarrow \frac{19-c}{c+3}=1 \rightarrow 19-c=c+3 \rightarrow 2c=16 \rightarrow c=8$

$\frac{b+16}{6a-1}=1 \rightarrow b+16=6a-1 \rightarrow 6a-b=17$

$6a-b=17$, $a+b=11$ → $7a=28 \rightarrow a=4 \rightarrow b=7$

A) 4 B) 5 C) 7 D) 8 E) 9

20)

$f:\mathbb{R}\to\mathbb{R},\ g:\mathbb{R}\to\mathbb{R},\ h:\mathbb{R}\to\mathbb{R},$

$(f\circ g\circ h)(x)=3-2x$, $h(3-2x)=g^{-1}(x+1) \Rightarrow f^{-1}(2)=?$

$g(h(3-2x))=x+1$

$f(g(h(x)))=3-2x \rightarrow f^{-1}(3-2x)=g(h(x))$

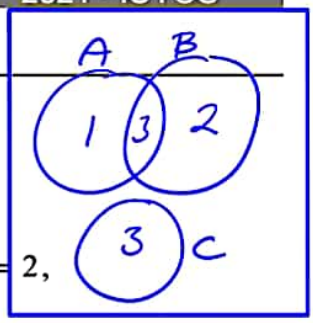
$3-2x=2 \rightarrow 1=2x \rightarrow x=\frac{1}{2}$

$f^{-1}(2)=g(h(\frac{1}{2}))$

$g(h(3-2x)) \xrightarrow{3-2x=\frac{1}{2}} g(h(\frac{1}{2}))=\frac{9}{4}$ (وقت داشتیم $2x-\frac{5}{2}$ هست؟)

A) 0 B) 1 C) 2 D) $\frac{9}{4}$ E) $\frac{9}{2}$

21)



$(A\cup B)\cap C=\emptyset,$

$n(A\setminus B)=1,\ n(B\setminus A)=2,$

$n(A\cap B)=n(C)=3$

$\Rightarrow n(A\cup B\cup C)=?$

A) 7 B) 8 C) 9 D) 10 E) 11

22)

$\frac{\cos x}{1+\sin x}+\tan x=?$

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

A) $\cos x$ B) $\frac{1}{\sin x}$ C) $\sin x$ D) $\cot x$ E) $\frac{1}{\cos x}$

نسبت متغیرین

$(f\circ g\circ h)(3-2x)=3-2(3-2x)=4x-6+4x=4x-3$

$f(g(h(3-2x)))=4x-3$

$f(g(g^{-1}(x+1)))=f(x+1)=4x-3=2$

$4x=5 \rightarrow x=\frac{5}{4}$