

1)

$$\begin{cases} xy = z + 4 \\ zx = y + 6 \\ z = 5 - y \end{cases} \Rightarrow x = ?$$

تقسیم: $\frac{xy}{zx} = \frac{z+4}{y+6} \rightarrow \frac{y}{5-y} = \frac{z+4}{y+6}$

A) 1 B) 2 C) 3

تقسیم: $y^2 + 6y = (9-y)(5-y) \rightarrow 70y = 45$

$$y = \frac{9}{4} \rightarrow z = \frac{11}{4}$$

1/1 $x = \frac{z+4}{y} = \frac{\frac{11}{4} + \frac{16}{4}}{\frac{9}{4}} = \frac{27}{9} = 3$

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

$$2a - 2i - ai + i^2 = 2a + 2i + ai + i^2$$

$$-4i = 2ai$$

$$a = -2$$

3)

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

$$\frac{\log_6 24}{\log_6 12} = \frac{\log_6 2 + \log_6 12}{\log_6 12} = \frac{\log_6 2 + x}{x}$$

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

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

$$\log_6 12 = \log_6 6 + \log_6 2 \rightarrow \log_6 2 = x - 1$$

* $P(x) = \alpha x^2 + \beta x + \gamma$

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

$a+b = ?$

حفظه با این قدرین:

$$P(x-2) = \alpha(x-2)^2 + \beta(x-2) + \gamma$$

$$P(2-x) = \alpha(2-x)^2 + \beta(2-x) + \gamma$$

A) -4 B) -2 C) 3

قطباً x^2 ها حذف می شوند!

D) 5 E) 6

$x=2: 0 = 4a - 2b + 12 \rightarrow 2a - b = -6$

$b = 6$

5)

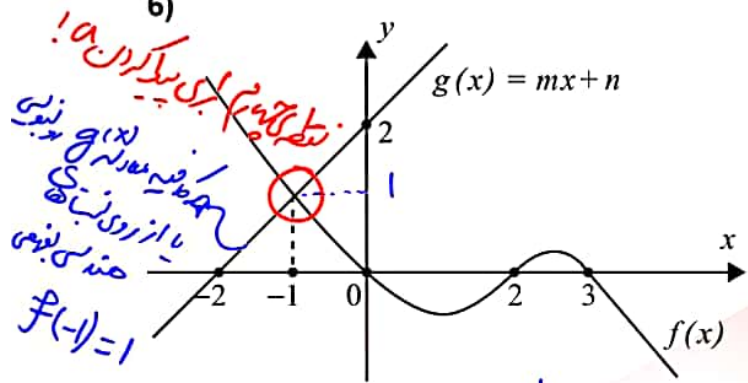
$$\frac{0,6 + \frac{0,08}{0,2}}{0,8 - \frac{0,06}{0,2}} = ?$$

$$\frac{\frac{6}{10} + \frac{8}{20}}{\frac{8}{10} - \frac{6}{20}} = \frac{\frac{20}{20}}{\frac{10}{20}} = 2$$

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

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

6)



$f(x) = ax^3 + bx^2 + cx + d = \frac{-1}{12}(x-0)(x-2)(x-3)$
 $f(12) = ?$

$f(12) = \frac{-1}{12}(12)(10)(9) = -96$

$f(-1) = a(-1)(-3)(-4) \rightarrow a = \frac{1}{12}$

- A) -60 B) -72 C) -84
 D) -90 E) -96

7)

$i = \sqrt{-1} \Rightarrow (1+i-i)^2 - (1-i^3-i)^3 = ?$
 $= (1-2i)^2 - (i)^3 = 1+4i^2-4i-i = -3-3i$

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

8)

$A = \frac{\sqrt{15}}{3} - \sqrt{9 - \frac{1}{9}} + \frac{\sqrt{405}}{27}$
 $\frac{3A}{\sqrt{5}} = ? \frac{3}{\sqrt{5}} \left(\frac{\sqrt{15}}{3} - \sqrt{\frac{80}{9}} + \frac{\sqrt{405}}{27} \right)$
 $= \sqrt{3} - 4 + 1 = \sqrt{3} - 3$

- A) $\sqrt{3}-3$ B) $1-\sqrt{3}$ C) $\sqrt{3}-\sqrt{5}$
 D) $\sqrt{3}-1$ E) $2\sqrt{3}$

9)

$A = \frac{3}{3 + \frac{1}{7}}, B = \frac{3}{1-A} \Rightarrow A \cdot B = ? \frac{21}{22} \left(\frac{3}{66} \right) = 63$

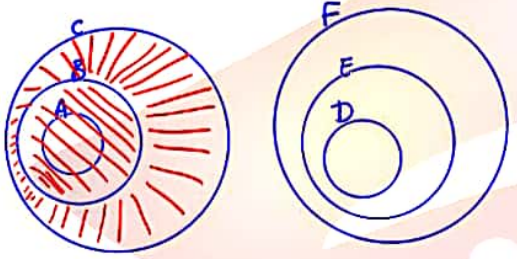
$A = \frac{3}{\frac{22}{7}} = \frac{21}{22}$ $B = \frac{3}{1-\frac{21}{22}} = \frac{3}{\frac{1}{22}} = 66$

- A) 42 B) 44 C) 52
 D) 63 E) 66

15)

$$\left. \begin{array}{l} A \subset B \subset C \\ D \subset E \subset F \end{array} \right\} \Rightarrow [(A \cup B) \cap (C \setminus B)] \cup [(D \setminus E) \cap (E \cap F)] = ?$$

- A) \emptyset B) $C \cap E$ C) $B \cap F$
 D) D E) E



16)

$$f(x\sqrt{2}) = (a-1)x^2 + b \quad \xrightarrow{x=\sqrt{3}} f(\sqrt{6}) = 3(a-1) + 10$$

$$g(x\sqrt{3}) = (a+1)x^2 + c \quad \xrightarrow{x=\sqrt{2}} g(\sqrt{6}) = 2(a+1) + 10$$

$$\left. \begin{array}{l} f(0) = g(0) = 10 \\ f(\sqrt{6}) = g(\sqrt{6}) \end{array} \right\} \Rightarrow f(1) + g(1) = ?$$

$$\left. \begin{array}{l} b = 10 \\ c = 10 \end{array} \right\} \Rightarrow 3a - 3 + 10 = 2a + 2 + 10 \Rightarrow a = 5$$

- A) 8 B) 12 C) 16
 D) 18 E) 24

$$x = \frac{1}{\sqrt{2}} \rightarrow f(1) = 4\left(\frac{1}{\sqrt{2}}\right)^2 + 10 = 12$$

$$x = \frac{1}{\sqrt{3}} \rightarrow g(1) = 6\left(\frac{1}{\sqrt{3}}\right)^2 + 10 = 12$$

17)

$$P(x) = ax^3 + bx^2 + cx + d \quad \left\{ \begin{array}{l} b=0 \\ d=0 \end{array} \right. \rightarrow P(x) = ax^3 + cx$$

$P(-x) = -P(x) \rightarrow$ *تکلیف به زوج نیست پس باید فرد باشد*

$$P(1) = 5$$

$$P(x) + 52 = (x+2)Q(x) \Rightarrow P(-2) + 52 = 0 \rightarrow P(-2) = -52$$

$$P(-3) = ?$$

$$\left. \begin{array}{l} a + c = 5 \rightarrow 2a + 2c = 10 \\ -8a - 2c = -52 \end{array} \right\} \rightarrow -6a = -42 \Rightarrow a = 7 \rightarrow c = -2$$

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

- D) 183 E) 195

$$P(x) = 7x^3 - 2x \rightarrow P(-3) = 7(-27) - 2(-3) = -189 + 6 = -183$$

18)

$$\left. \begin{array}{l} 8^{x+1} = 125^y \\ 25^x = 4^{y-1} \end{array} \right\} \Rightarrow x - y = ?$$

$$\left\{ \begin{array}{l} 2^{3(x+1)} = 5^{3y} \\ 2^{2(y-1)} = 5^{2x} \end{array} \right. \rightarrow \frac{3(x+1)}{2(y-1)} = \frac{3y}{2x}$$

- A) -2 B) -1 C) 0

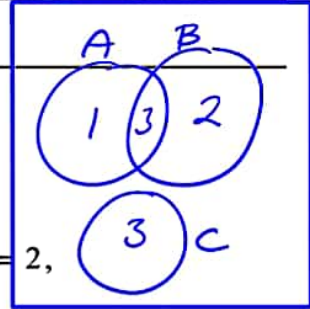
- D) 1 E) 2

$$x^2 + x = y^2 - y$$

$$x^2 - y^2 + x + y = 0$$

$$(x-y)(x+y) \rightarrow (x+y)(x-y+1) = 0$$

$$\underline{x-y = -1}$$



19)

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

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

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

$$a+b=19-c \rightarrow a+b=11$$

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

A) 4 B) 5 C) 7

D) 8 E) 9

$$\begin{cases} 6a-b=17 \\ a+b=11 \end{cases}$$

$$7a=28 \rightarrow a=4 \rightarrow b=7$$

20)

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

$$\left. \begin{aligned} (f \circ g \circ h)(x) &= 3-2x \\ h(3-2x) &= g^{-1}(x+1) \end{aligned} \right\} \Rightarrow f^{-1}(2) = ?$$

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

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

A) 0 B) 1 C) 2

D) $\frac{9}{4}$

E) $\frac{9}{2}$

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

$$g(h(3-2x)) \xrightarrow{3-2x=\frac{1}{2}} g(h(\frac{1}{2})) = \frac{9}{4}$$

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)

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

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

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

D) $\cot x$ E) $\frac{1}{\cos x}$

نسی معین نین

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

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

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