16

SOLVE FOR X

2016A

2. For what value of x does $10^x \cdot 100^{2x} = 1000^5$?

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

2004A 2. For any three real numbers a, b, and c, with $b \neq c$, the operation ¶ is defined by

$$¶(a,b,c) = \frac{a}{b-c}.$$

What is $¶\,(¶(1,2,3), ¶(2,3,1), ¶(3,1,2))$?

(A) $-\frac{1}{2}$ **(B)** $-\frac{1}{4}$ **(C)** 0 **(D)** $\frac{1}{4}$ **(E)** $\frac{1}{2}$

2005A 2. For each pair of real numbers $a \neq b$, define the operation $\star$ as

$$(a \star b) = \frac{a+b}{a-b}.$$

What is the value of $((1 \star 2) \star 3)$?

(A) $-\frac{2}{3}$ **(B)** $-\frac{1}{5}$ **(C)** 0 **(D)** $\frac{1}{2}$ **(E)** This value is not defined.

2006A

2. Define $x \otimes y = x^3 - y$. What is $h \otimes (h \otimes h)$?

(A) $-h$ **(B)** 0 **(C)** h **(D)** $2h$ **(E)** h^3

2006B

2. For real numbers x and y, define $x \spadesuit y = (x+y)(x-y)$. What is $3 \spadesuit (4 \spadesuit 5)$?

(A) -72 **(B)** -27 **(C)** -24 **(D)** 24 **(E)** 72

2007A

2. Define $a@b = ab - b^2$ and $a\#b = a + b - ab^2$. What is $\frac{6@2}{6\#2}$?

(A) $-\frac{1}{2}$ **(B)** $-\frac{1}{4}$ **(C)** $\frac{1}{8}$ **(D)** $\frac{1}{4}$ **(E)** $\frac{1}{2}$

2007B

2. Define the operation $\star$ by $a \star b = (a+b)b$. What is $(3 \star 5) - (5 \star 3)$?

(A) -16 **(B)** -8 **(C)** 0 **(D)** 8 **(E)** 16

2016B

2. If $n \heartsuit m = n^3 m^2$, what is $\frac{2 \heartsuit 4}{4 \heartsuit 2}$?

(A) $\frac{1}{4}$ **(B)** $\frac{1}{2}$ **(C)** 1 **(D)** 2 **(E)** 4

2004A 4. What is the value of x if $|x-1| = |x-2|$?

$\textbf{(A)}\ -\frac{1}{2} \qquad \textbf{(B)}\ \frac{1}{2} \qquad \textbf{(C)}\ 1 \qquad \textbf{(D)}\ \frac{3}{2} \qquad \textbf{(E)}\ 2$

2005B 4. For real numbers a and b, define $a \diamond b = \sqrt{a^2 + b^2}$. What is the value of

$$(5 \diamond 12) \diamond ((-12) \diamond (-5)) \ ?$$

$\textbf{(A)}\ 0 \qquad \textbf{(B)}\ \frac{17}{2} \qquad \textbf{(C)}\ 13 \qquad \textbf{(D)}\ 13\sqrt{2} \qquad \textbf{(E)}\ 26$

2010B 4. For a real number x, define $\heartsuit(x)$ to be the average of x and x^2. What is $\heartsuit(1) + \heartsuit(2) + \heartsuit(3)$?

$\textbf{(A)}\ 3 \qquad \textbf{(B)}\ 6 \qquad \textbf{(C)}\ 10 \qquad \textbf{(D)}\ 12 \qquad \textbf{(E)}\ 20$

2017B 4. Suppose that x and y are nonzero real numbers such that

$$\frac{3x+y}{x-3y} = -2.$$

What is the value of

$$\frac{x+3y}{3x-y}\ ?$$

$\textbf{(A)}\ -3 \qquad \textbf{(B)}\ -1 \qquad \textbf{(C)}\ 1 \qquad \textbf{(D)}\ 2 \qquad \textbf{(E)}\ 3$

2003A 5. Let d and e denote the solutions of $2x^2 + 3x - 5 = 0$. What is the value of $(d-1)(e-1)$?

$\textbf{(A)}\ -\frac{5}{2} \qquad \textbf{(B)}\ 0 \qquad \textbf{(C)}\ 3 \qquad \textbf{(D)}\ 5 \qquad \textbf{(E)}\ 6$

2008B

5. For real numbers a and b, define $a\$b = (a-b)^2$. What is $(x-y)^2\$(y-x)^2$?

(A) 0 **(B)** x^2+y^2 **(C)** $2x^2$ **(D)** $2y^2$ **(E)** $4xy$