

7. Which of the following is equivalent to  $\sqrt{\frac{(x)x}{(1 - \frac{x-1}{x})x}}$  when  $x < 0$ ?

- (A)  $-x$  (B)  $x$  (C)  $1$  (D)  $\sqrt{\frac{x}{2}}$  (E)  $x\sqrt{-1}$

$$\sqrt{\frac{x^2}{x-x+1}} = \sqrt{x^2} = |x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

6. For how many positive integers  $n$  is  $n^2 - 3n + 2$  a prime number?

- (A) none (B) one (C) two (D) more than two, but finitely many  
(E) infinitely many

$$\begin{aligned} & (n-2)(n-1) \\ n=3 & \leftarrow \textcircled{1} \quad (3-1) = 2 \quad \checkmark \\ \times \quad 0 & = (2-2) \textcircled{1} \rightarrow n=2 \\ n=1 & \leftarrow \textcircled{-1} \quad (1-1) = 0 \quad \times \\ \checkmark \quad 2 & = (0-2) \textcircled{-1} \rightarrow n=0 \end{aligned}$$

20. Suppose that the number  $a$  satisfies the equation  $4 = (a + a^{-1})^2$ . What is the value of  $a^4 + a^{-4}$ ?

- (A) 164    (B) 172    (C) 192    (D) 194    (E) 212

$$196 = a^4 + 2 + \frac{1}{a^4} \quad 16 = a^2 + 2 + \frac{1}{a^2}$$

$$(14)^2 = \left(a^2 + \frac{1}{a^2}\right)^2$$

$$(x+1)^2 = x^2 + 2x + 1$$

$$21^2 = 441$$

$$(x+2)^2 = x^2 + 4x + 4$$

$$31^2 = 961$$

$$(x+3)^2 = x^2 + 6x + 9$$

$$(x+4)^2 = x^2 + 8x + 16 \quad \begin{pmatrix} x \\ y \\ z \end{pmatrix}^2 = \begin{matrix} 2xy & x^2 & 2xz \\ y^2 & & z^2 \\ 2yz & & \end{matrix}$$

$$(x+y+z)^2 = x^2 + y^2 + z^2 + 2xy + 2xz + 2yz$$

$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

$$\left(x + \frac{1}{x}\right)^2 = x^2 + 2 + \frac{1}{x^2}$$

radicals

$$1) \sqrt[4]{243 \cdot x^5 y^9}$$

$$= \sqrt[4]{3^5 \cdot x^5 y^9}$$

$$= \overset{5}{\cancel{3}} \overset{5}{\cancel{x}} \overset{9}{\cancel{y}}$$

$$= 3 \times y$$

$$= \overset{1}{\cancel{3}} \overset{1}{\cancel{x}} \overset{2}{\cancel{y}} = 3xy^2 \sqrt[4]{3xy}$$

$$2) \frac{6}{\sqrt{2}-1}$$

$$3) \frac{6}{(\sqrt[3]{2}-1)(\sqrt[3]{4}+\sqrt[3]{2}+1)}$$