The inequality

$$\frac{1}{x-1}+\frac{2(x+2)}{x^2-1}+\frac{1}{x+1}>0$$

is satisfied for

- A. $x > -1$
- B. $x < 0$
- C. every real number x
- D. $x > 1$ ✓
- E. $x \neq \pm 1$

$$\frac{x+\cancel{1}+2x+4+x-\cancel{1}}{(x-1)(x+1)}>0$$

$$\frac{4x+4}{(x-1)(x+1)}>0 \Rightarrow \frac{4\cancel{(x+1)}}{(x-1)\cancel{(x+1)}}>0$$

$$+\ \frac{4}{(x-1)}>0$$

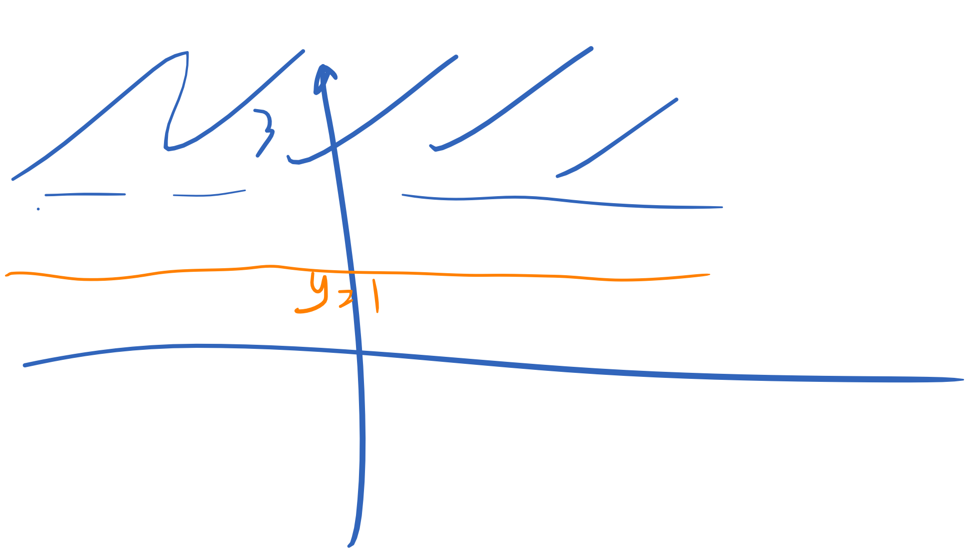
$x-1>0$

$x>1$

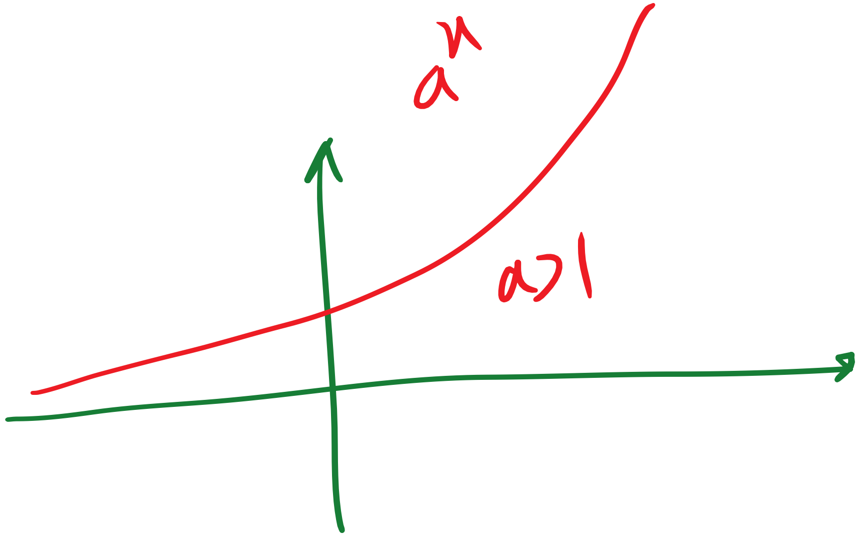
Which among the following functions has the graph fully contained in the halfplane $y > 1$ of the Cartesian plane?

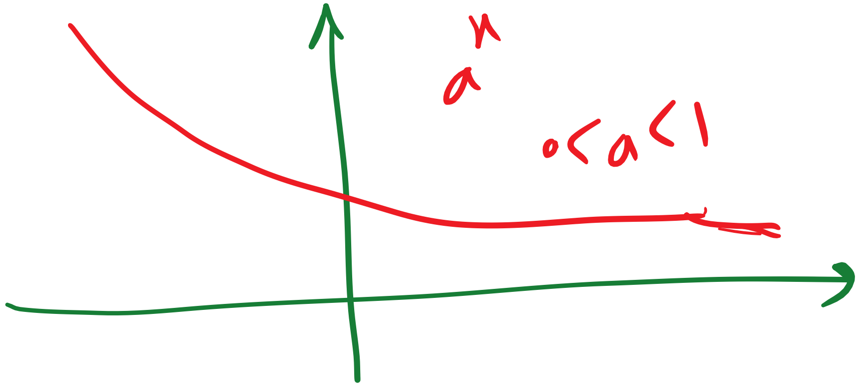
$$\frac{7^3}{7^0}$$

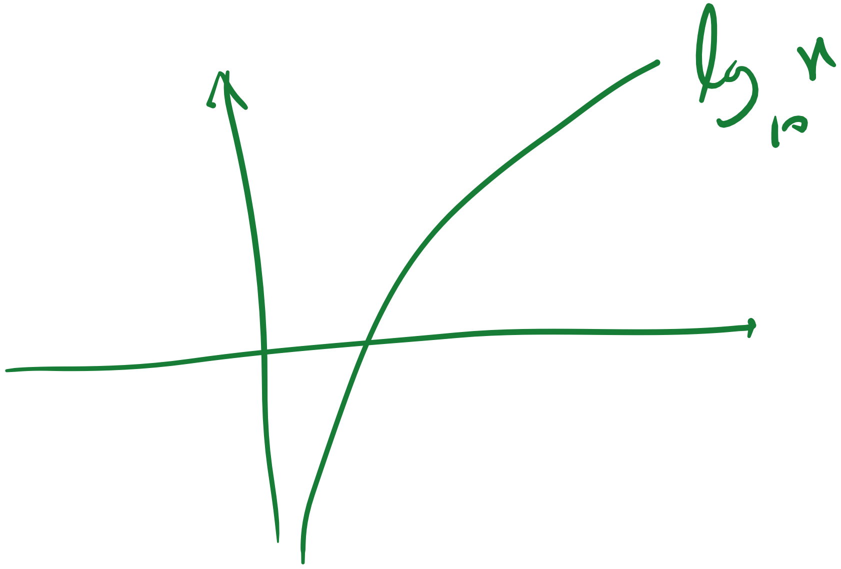
- A. $y = 10^{-x} + 3$
- B. $y = |\log_{10} x|$
- C. $y = 2 + \log_{10} x$
- D. $y = x^2$
- E. $y = 10^x$

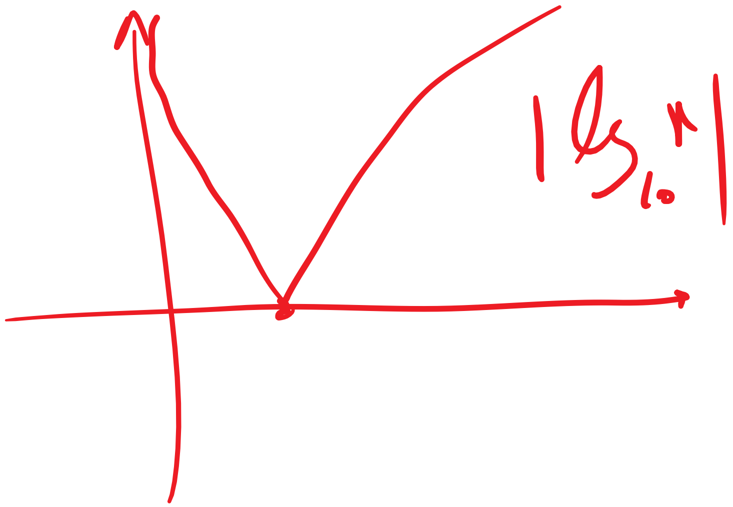


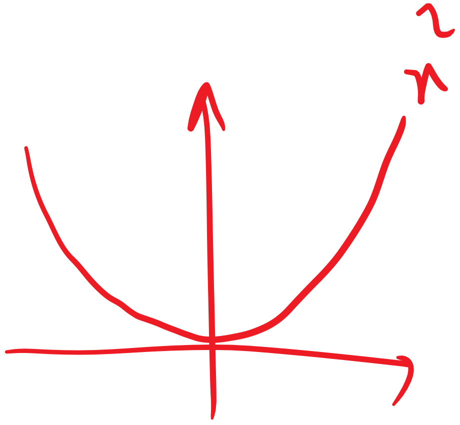
$10^{-x} = (10^{-1})^x = (0.1)^x$

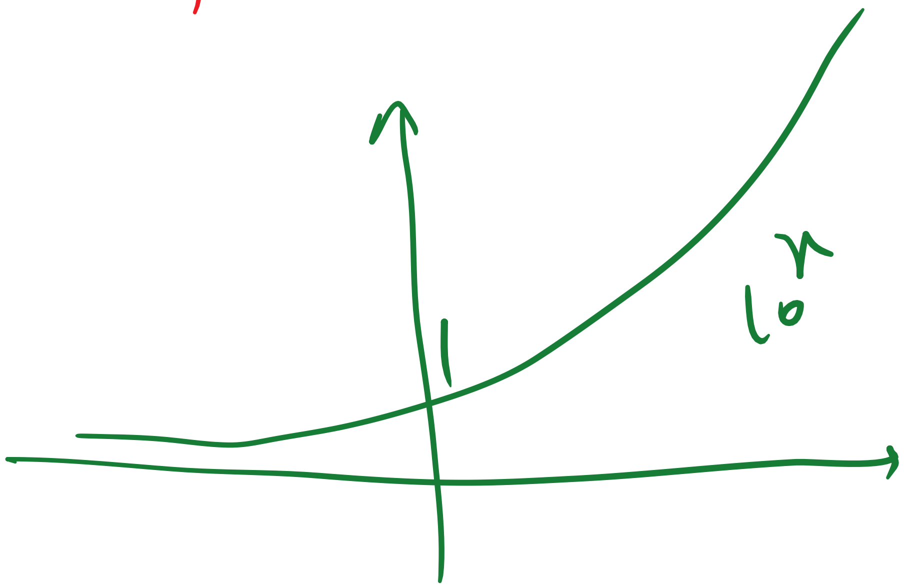





$\log_{10} x$


$|\log_{10} x|$


x^2


10^x
1

If the measure of an angle is 15°, its measure in radians is

$30^\circ = \frac{\pi}{6} \xrightarrow{\div} 15^\circ = \frac{\pi}{12}$

$D \times \frac{\pi}{180} \longrightarrow R$

$R \times \frac{180}{\pi} \longrightarrow D$

- A. $\frac{\pi}{18}$
- ✓ B. $\frac{\pi}{12}$
- C. $\frac{\pi}{10}$
- D. $\frac{\pi}{24}$
- E. $\frac{\pi}{2}$

$15^\circ \times \frac{\pi}{180} = \frac{\pi}{12}$

In the Cartesian plane, the straight line with equation

$$x + 2y + 2 = 0 \longrightarrow 2(y+1) = -x$$

and the parabola with equation

$$y+1 = -\frac{x}{2} \rightarrow \begin{cases} y = -\frac{x}{2} - 1 \\ y = (x-1)^2 \end{cases}$$

$$y = (x-1)^2$$

have

$$(x-1)^2 = -\frac{x}{2} - 1 \Rightarrow x^2 - 2x + 1 = -\frac{x}{2} - 1$$

$$x^2 - \frac{3}{2}x + 2 = 0$$

$$\Delta = \frac{9}{4} - 8 < 0 \longrightarrow$$

ليس لها حل

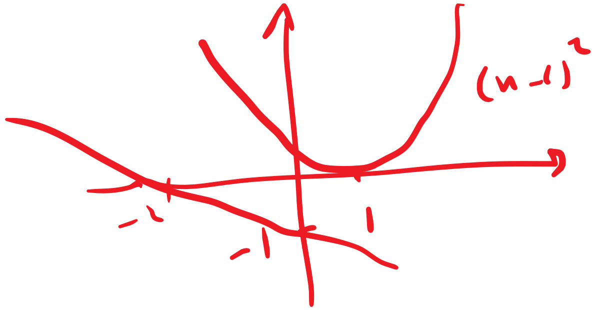
لا تقاطع

- A. four distinct intersection points
- B. a unique intersection point
- C. three distinct intersection points
- D. no intersection point ✓
- E. two distinct intersection points

$x+2y+2=0$

$x=0 \rightarrow y=-1$

$y=0 \rightarrow x=-2$



$2x-y-1=0 \qquad y=x^2-1$

$$\begin{cases} y=2x-1 \\ y=x^2-1 \end{cases}$$

$x^2-1=2x-1$

$x^2-2x=0$

$x(x-2)=0$

$$\begin{cases} x=0 \\ x=2 \end{cases}$$

دو ریشه

دو نقطه تقاطع دارند

The solution of the inequality

$$\log_{10} x > \log_{10}(x-1)$$

is

$0 <$ داخل لگاریتم و پایه لگاریتم

$1 \neq$ پایه لگاریتم

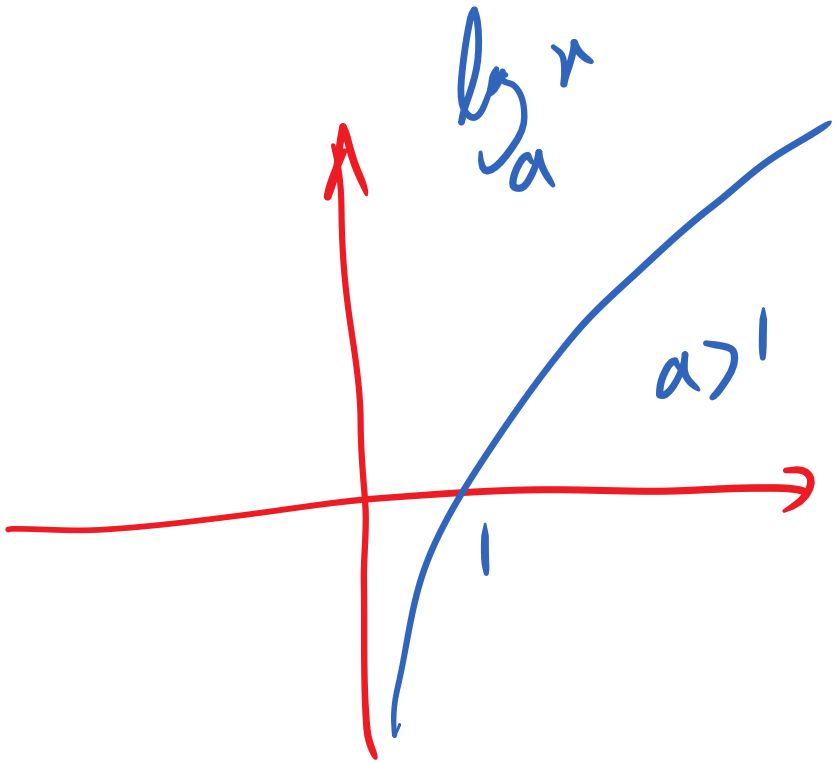
$x > 0$

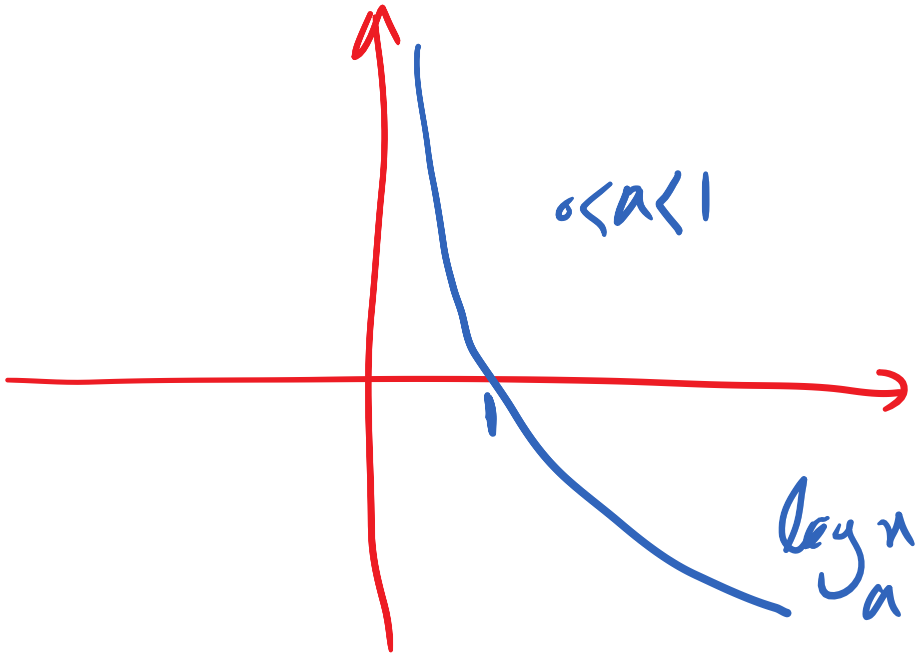
$x - 1 > 0$

$x > 1$

$\boxed{x > 1}$

- A. $0 < x < 1$
- B. $x > 1$ ✓
- C. $x > 0$
- D. every real value of x
- E. $x \geq 1$





DAAN
ACADEMY

The product of two positive real numbers x and y with $x < y$

حاصل ضرب

x	y	xy
1	2	2
2	3	6
0.1	0.2	0.02

- A. can be greater than y or less than x
- ~~B~~. is always greater than y
- ~~C~~. can be neither equal to x nor equal to y
- ~~D~~. is always between x and y
- ~~E~~. is always less that x

$\boxed{x>1}$

$\log_b a = c$ $\quad a = b^c$

The set of solutions to the inequality

$$\log_{10}\left(\overbrace{\log_{10} \underset{x>0}{x}}^{>0}\right) < \frac{1}{2}$$

is

$\log_b a < c \xrightarrow{b>1} a < b^c$

$\log_{10} x < 10^{\frac{1}{2}}$ $\quad \sqrt{10}$

$\log_{10} x < \sqrt{10}$

$\boxed{x < 10^{\sqrt{10}}}$

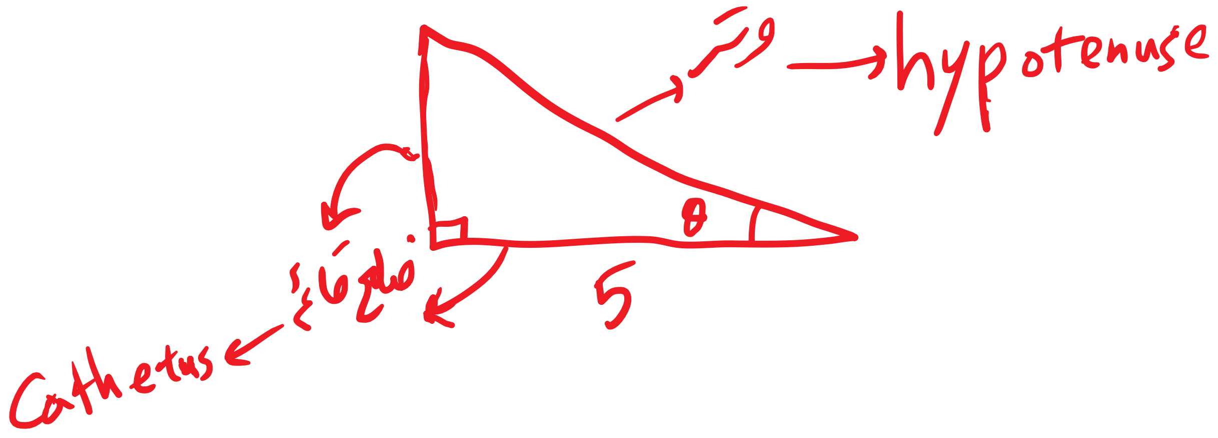
- A. $x < 10$
- B. $1 < x < 10^{\sqrt{10}}$ ✓
- C. $x < 10^{\sqrt{10}}$
- D. every real value of x
- E. $1 < x < 10$

Only one of the following polynomials vanishes both for $x = -2$ and for $x = 2$. Which one?

- A. $P(x) = 2x^3 + x^2 - 8x - 4$ ✓ $P(2) = 0$, $P(-2) = 0$
- B. $P(x) = 2x^3 + 3x^2 - 3x - 2$
- C. $P(x) = 2x^3 + x^2 - 2x - 1$
- D. $P(x) = 2x^3 - 5x^2 + x + 2$
- E. $P(x) = 2x^3 - x^2 - 5x - 2$

In a right-angled triangle a cathetus is 5 cm long, and the cosine of the adjacent angle is equal to 4/5.

Determine the length of the hypotenuse (in cm)?



- A. 4
- ✓ B. 6,25
- C. 10
- D. 8,33
- E. 3

$$\cos\theta = \frac{5}{x} = \frac{4}{5} \Rightarrow 4x = 25 \rightarrow x = \frac{25}{4} = 6.25$$

معادله دایره $(x-\alpha)^2+(y-\beta)^2=R^2$

مرکز $=(\alpha,\beta)$ شعاع $=R$

Let us consider, in the Cartesian plane, the family of circles with equation

$$x^2+y^2-4x-4y=K,$$

where K is a real parameter. Does there exist a circumference of the family which is tangent to both coordinated axes?

$$x^2-4x+4-4+y^2-4y+4-4=K$$

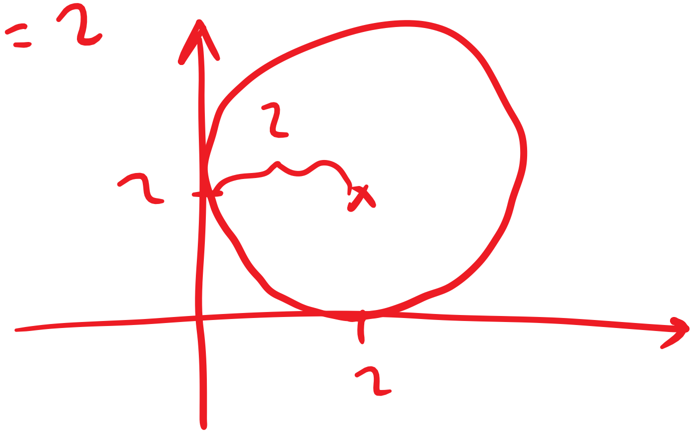
$$(x-2)^2+(y-2)^2=K+8=2^2$$

- A. Yes, for $K=-4$
- B. Yes, for $K=12$
- C. Yes, for $K=4$
- D. No
- E. Yes, for $K=0$

$$K+8=4$$

$$K=4-8$$

$$K=-4$$



The set of real numbers x that satisfy the inequality

$$-x^2 + 7 > 0$$

is

$x^2 < a \rightarrow |x| < \sqrt{a}$

$x^2 < 7$

$\boxed{|x| < \sqrt{7}}$

- A. $|x| < \sqrt{7}$ ✓
- B. $|x| > \sqrt{7}$
- C. $x < 0$
- D. $x > \sqrt{7}$
- E. $x < -\sqrt{7}$

$x^2 < a \longrightarrow -\sqrt{a} < x < \sqrt{a}$

$x^2 > a \longrightarrow x > \sqrt{a}$ & $x < -\sqrt{a}$

$|x| < a \longrightarrow -a < x < a$

$|x| > a \longrightarrow x > a$ & $x < -a$

Three times 27^3 is

- A. 81^3
- B. 3^7
- C. 3^9
- D. 27^4
- E. 3^{10} ✓

$3 \times 27^3 = 3 \times (3^3)^3 = 3^1 \times (3^9) = 3^{10}$

Two integers x and y have different sign. Their sum is

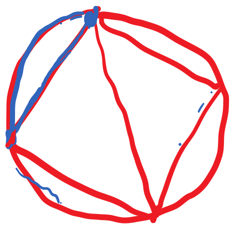
- A. always zero
- B. negative if $|x| > |y|$ and $x > 0$
- C. always negative
- D. positive if $|x| > |y|$ and $x > 0$
- E. always positive

x y

3 -2

If the diagonal of a square and the diameter of a circle have the same length, then

- A. the square and the circle are equivalent
- B. the perimeter of the square is longer then the circumference, and the area of the square is greater than the area of the circle
- C. the perimeter of the square is shorter then the circumference, and the area of the square is less than the area of the circle
- D. the perimeter of the square is longer then the circumference, and the area of the square is less than the area of the circle
- E. the perimeter of the square is shorter then the circumference, and the area of the square is bigger than the area of the circle



For every real number $a > 0$, the expression

$$\sqrt[3]{a \cdot \sqrt{a}} : \sqrt[4]{a^2 \cdot \sqrt[3]{a^2}}$$

is equal to

نقسم

- A. $\sqrt[6]{\frac{1}{a}}$
- B. $\sqrt[6]{a}$
- C. a
- D. 1
- E. $\frac{1}{\sqrt[3]{a}}$

$$= \frac{\sqrt[3]{a \times a^{\frac{1}{2}}}}{\sqrt[4]{a^2 \cdot a^{\frac{2}{3}}}} = \frac{\sqrt[3]{a^{\frac{3}{2}}}}{\sqrt[4]{a^{\frac{8}{3}}}} = \frac{\left(a^{\frac{3}{2}}\right)^{\frac{1}{3}}}{\left(a^{\frac{8}{3}}\right)^{\frac{1}{4}}} = \frac{a^{\frac{1}{2}}}{a^{\frac{2}{3}}}$$

$$= a^{\frac{1}{2}-\frac{2}{3}} = a^{\frac{3-4}{6}} = a^{-\frac{1}{6}} = \frac{1}{a^{\frac{1}{6}}} = \sqrt[6]{\frac{1}{a}}$$