$f(x) = \frac{1}{x}$ Simplify the

Difference Quotient. $\frac{f(x) - f(a)}{x-a} = \boxed{}$

$$\frac{\frac{1}{x} - \frac{1}{a}}{\frac{x-a}{1}} = \frac{1}{x-a}\left[\frac{1}{x} - \frac{1}{a}\right]$$

LCD = ax

$$= \frac{1}{x-a}\left[\frac{1}{x} \cdot \frac{a}{a} - \left(\frac{1}{a}\right)\left(\frac{x}{x}\right)\right]$$

$$= \frac{1}{x-a}\left[\frac{a-x}{ax}\right] = \frac{a-x}{(x-a)(ax)} = \frac{-\cancel{(x-a)}}{\cancel{(x-a)}(ax)}$$

$a - x = -(x-a)$ $$= \frac{-1}{ax} = -\frac{1}{ax}$$

$g(x) = \frac{1}{x}$. Simply the difference Quotient

$$\frac{g(x+h)-g(x)}{h} = \frac{\frac{1}{x+h} - \frac{1}{x}}{h} = \frac{1}{h}\left[\frac{1}{x+h} - \frac{1}{x}\right]$$

LCD $= x(x+h)$

$$= \frac{1}{h}\left[\left(\frac{1}{x+h}\right)\left(\frac{x}{x}\right) - \underline{\left(\frac{1}{x}\right)\left(\frac{x+h}{x+h}\right)}\right]$$

$$= \frac{1}{h}\left[\frac{x-(x+h)}{LCD}\right] = \frac{1}{h}\left[\frac{x-x-h}{LCD}\right]$$

$$= \frac{1}{\cancel{h}_{1}}\left[\frac{-\cancel{h}^{1}}{LCD}\right] = \frac{-1}{x(x+h)}$$

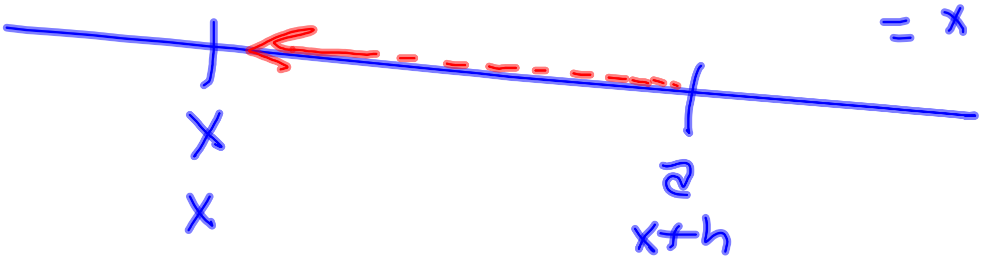
$$\frac{g(x)-g(a)}{x-a} = -\frac{1}{ax} \xrightarrow{a \to x} -\frac{1}{x^2}$$

$$\frac{g(x+h)-g(x)}{h} = -\frac{1}{x(x+h)} \xrightarrow{h \to 0} \frac{-1}{x^2}$$

$x(x+h) \xrightarrow{h \to 0} x(x+0)$

$= x(x) = x^2$

$x + x = 2x$



$\sqrt{x}$ means $x^{\frac{1}{2}}$

$\sqrt[3]{x}$ means $x^{\frac{1}{3}}$

$\sqrt[3]{8} = \sqrt[3]{2 \cdot 2 \cdot 2} = 2$

cube or 3^{rd} root.

Assume $x > 0$

$\sqrt[5]{125}$

$$\sqrt{x^3} = \sqrt{x^2 \cdot x}$$

$$= \sqrt{x^2}\sqrt{x}$$

$$= x\sqrt{x}$$

POSITIVE

$\sqrt{}$ is $\boxed{\text{principal}}$ square root

$\sqrt[3]{}$ is $\boxed{\text{principal}}$ 3^{rd} root

Real.

$$\sqrt{144}$$

$$= \sqrt{2\cdot2\cdot2\cdot2\cdot3\cdot3}$$

$$= 2\cdot2\cdot3$$

$$= 12$$

$$\begin{array}{r|l} 2 & 144 \\ 2 & 72 \\ 2 & 36 \\ 2 & 18 \\ 3 & 9 \\ & 3 \end{array}$$

$$\sqrt{288} = \sqrt{2\cdot2\cdot2\cdot2\cdot2\cdot3\cdot3}$$

$$2\cdot2\cdot3\sqrt{2} = 12\sqrt{2}$$

$$\begin{array}{r|l} 2 & 288 \\ 2 & 144 \\ 2 & 72 \\ 2 & 36 \\ 2 & 18 \\ 3 & 9 \\ & 3 \end{array}$$

$$\sqrt{288} = \sqrt{2^5 \cdot 3^2} = \left(2^5 \cdot 3^2\right)^{\frac{1}{2}}$$

$$= \left(2^{4+1} \cdot 3^2\right)^{\frac{1}{2}}$$

$$= \left(2^4 \cdot 2^1 \cdot 3^2\right)^{\frac{1}{2}}$$

$$= 2^{4(\frac{1}{2})} \cdot 2^{1 \cdot \frac{1}{2}} \cdot 3^{2 \cdot \frac{1}{2}}$$

$$= 2^{\frac{4}{2}} \cdot 2^{\frac{1}{2}} \cdot 3^1$$

$$= 2^2 \cdot 2^{\frac{1}{2}} \cdot 3$$

$$= 4 \cdot 2^{\frac{1}{2}} \cdot 3$$

$$= 12 \cdot 2^{\frac{1}{2}}$$

$$= 12\sqrt{2}$$

$$\left(a^b \cdot c^d\right)^e = a^{be} c^{de}$$

$$\left(2^3 \cdot 3^4\right)^5 = 2^{15} \cdot 3^{20}$$