Simplify $4 \times 4 \div 4 \times 4 = 16$

$\underline{16 \div 4}$

$4 \times 4 = 16$ ✓

$(4 \times 4) \div (4 \times 4) = 1$

$16 \div 16 = 1$ ✓

$$X^{2/3} \cdot X^{\frac{1}{5}} = X^{\frac{10+3}{15}}$$

Key $a^n a^m = a^{n+m}$

$$= \boxed{X^{13/15}}$$

$$(-2a^{3/4})(5a^{3/2}) = -10\, a^{\frac{3}{4}+\frac{3}{2}}$$

$$= -10\, a^{\frac{3+6}{4}} = \boxed{-10\, a^{9/4}}$$

$$(4x^6y^8)^{\frac{3}{2}}$$

Key $(ab)^n = a^n b^n$

Key $(a^n)^m = a^{nm}$

$$4^{3/2}(x^6)^{\frac{3}{2}}(y^8)^{3/2}$$

$$(2^2)^{\frac{3}{2}} x^9 y^{12} = \boxed{8x^9y^{12}}$$

Key $a^{-n} = \frac{1}{a^n}$

$\frac{1}{a^n} = a^n$

$$(x^{-5}y^3z^{10})^{-\frac{3}{5}} = x^3 y^{-9/5} z^{-6} = \boxed{\frac{x^3}{y^{9/5}z^6}}$$

$$\left(\frac{-2x^{1/3}}{y^{1/2}z^{1/6}}\right)^4 = \frac{+2^4x^{4/3}}{y^2z^{2/3}} = \boxed{\frac{16x^{4/3}}{y^2z^{2/3}}}$$

$$\left(\frac{a^2b^{-3}}{x^{-1}y^2}\right)^3\left(\frac{x^{-2}b^{-1}}{a^{3/2}y^{1/3}}\right) = \frac{a^6b^{-9}}{x^{-3}y^6}\cdot\frac{x^{-2}b^{-1}}{a^{3/2}y^{1/3}}$$

$$5x^{-1} = 5\cdot\frac{1}{x} = \frac{5}{x}$$

$$\frac{a}{b} = ab^{-1} = a\cdot\frac{1}{b}$$

Key $\frac{a^n}{a^m} = a^{n-m}$

$$\frac{a}{b} = \frac{1}{\frac{b}{a}}$$

$$\frac{6}{1}+\frac{1}{3} = \frac{18+1}{3} = \frac{19}{3}$$

D $$\frac{a^6x^{-2}b^{-10}}{x^{-3}a^{3/2}y^{19/3}} = \boxed{\frac{a^{9/2}x}{b^{10}y^{19/3}}}$$

$$\cancel{\left(\frac{1}{2}+\frac{1}{3}\right)}$$

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

$$=\left(\frac{5}{6}\right)^{-1}=\boxed{\frac{6}{5}}$$

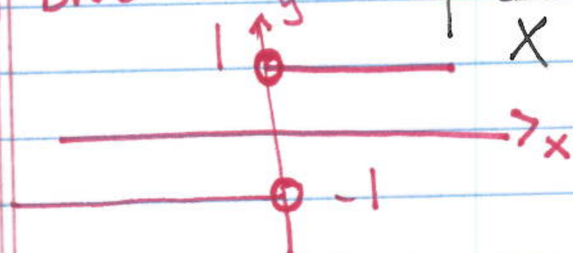
$$f(x)=|x|=\begin{cases} x & \text{if } x\geq 0 \\ -x & \text{if } x<0 \end{cases}$$

$$|3|=3$$

$$|-5|=-(-5)=5$$

$$g(x)=\frac{|x|}{x}=\begin{cases} \frac{x}{x}=1 & \text{if } x>0 \\ \frac{-x}{x}=-1 & \text{if } x<0 \end{cases}$$

$g(0)$ DNE



Domain of g : $(-\infty,0)\cup(0,\infty)$.
Left side of 0   Right of zero.

Range of g $\{-1,1\}$

Simplify $\frac{|x+1|}{x+1} = \begin{cases} 1 & \text{if } x+1>0 \\ & \boxed{x>-1} \\ -1 & \text{if } x+1<0 \\ & \boxed{x<-1} \end{cases}$

$$\frac{|x-4|}{x-4} = \begin{cases} 1 & \text{if } x-4>0 \therefore x>4 \\ -1 & \text{if } x-4<0 \therefore x<4 \end{cases}$$

$f(x) = x^2$

$f(1) = 1$

$f(-1) = (-1)^2 = 1$

$f(3) = (3)^2 = 9$

$f(1+h) = 1+2h+h^2 = (1+h)^2$

$$\frac{f(a+h)-f(h)}{h} = \frac{(a+h)^2 - h^2}{h}$$

$$= \frac{a^2+2ah+\cancel{h^2}-\cancel{h^2}}{h}$$

$$= \frac{a^2+2ah}{h} = \frac{a^2}{h} + 2a$$

Simplify: $\dfrac{f(a+h)-f(a)}{h}$ Difference Quotient

DQ

Given ① $f(x) = \dfrac{1}{x}$

② $f(x) = \sqrt{x}$

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① $f(x) = \dfrac{1}{x}$ $\therefore$ $DQ = \dfrac{f(a+h)-f(a)}{h}$

$$= \dfrac{\dfrac{1}{a+h} - \dfrac{1}{a}}{h}$$

$$= \dfrac{\dfrac{a-(a+h)}{(a+h)a}}{h}$$

$$= \dfrac{\dfrac{-h}{(a+h)a}}{\dfrac{h}{1}}$$

$h \neq 0$

$$= \dfrac{-\cancel{h}}{(a+h)a} \cdot \dfrac{1}{\cancel{h}} = \boxed{\dfrac{-1}{(a+h)a}}$$

(2) $f(x) = \sqrt{x}$

$$DQ = \frac{f(a+h) - f(a)}{h}$$

$$= \frac{(\sqrt{a+h} - \sqrt{a})}{h} \cdot \frac{(\sqrt{a+h} + \sqrt{a})}{(\sqrt{a+h} + \sqrt{a})}$$

Rationalization

$$\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{\sqrt{2}}{2}}$$

$$\frac{2}{\underbrace{3+\sqrt{7}}} \cdot \frac{3-\sqrt{7}}{\underbrace{3-\sqrt{7}}} = \frac{2(3-\sqrt{7})}{(9-7)} = \frac{\cancel{2}(3-\sqrt{7})}{\cancel{2}} = \boxed{3-\sqrt{7}}$$

Conjugate

$$(a+b)(a-b) = a^2 - b^2$$

$$f(x) = \sqrt{x} \; ; \; DQ = \frac{f(a+h) - f(a)}{h} = \frac{(\sqrt{a+h} - \sqrt{a})}{h} \cdot \frac{(\sqrt{a+h} + \sqrt{a})}{(\sqrt{a+h} + \sqrt{a})}$$

$$= \frac{(a+h) - a}{h(\sqrt{a+h} + \sqrt{a})} = \frac{\cancel{h}}{\cancel{h}(\sqrt{a+h} + \sqrt{a})} \; \boxed{h \neq 0} = \boxed{\frac{1}{\sqrt{a+h} + \sqrt{a}}}$$