February 20, 2024

Applications of Rational Functions

D R T

$R = \frac{D}{T}$

$R \cdot T = D$

$\frac{mi}{h} \cdot h =$

$T = \frac{D}{R}$

	D ÷ R = T		
down	140	15+x	$\frac{140}{15+x}$
up	35	15−x	$\frac{35}{15-x}$

boat ± river

x = speed of river

$(15+x)(15-x)\left[\frac{140}{15+x} = \frac{35}{15-x}\right](15+x)(15-x)$ $x \neq \pm 15$

$140(15-x) = 35(15+x)$

$2100 - 140x = 525 + 35x$

-525

$\frac{1575}{175} = \frac{175x}{175}$

$9 \frac{km}{h} = x$

	D	÷ R	= T
down	140	15+x	$\frac{140}{15+x}$
up	140	15−x	$\frac{140}{15-x}$

Total trip took 4 hours.

$$\frac{140}{15+x} + \frac{140}{15-x} = 4$$

The time to go upstream was $\frac{3}{4}$ of hour more than the time to go downstream.

$$\text{More Time} - \text{Less Time} = \frac{3}{4}$$

$$(15-x)(15+x)\left[\frac{140}{15-x} - \frac{140}{15+x} = \frac{3}{4}\right]4$$

2/

D ÷ R = T		
avg	270	x	$\frac{270}{x}$
faster	270	$x+9$	$\frac{270}{x+9}$

x = avg speed

$x \neq 0, -9$

$$x\left(\frac{270}{x} - \frac{270}{x+9}\right) = x(x+9)$$

(More Time − Less Time = $x(x+9)$)

$$270(x+9) - 270x = x(x+9)$$

$$270x + 2430 - 270x = x^2 + 9x$$

$$0 = x^2 + 9x - 2430$$

$$x = \frac{-9 \pm \sqrt{81 + 4(1)(+2430)}}{2(1)}$$

$$= \frac{-9 \pm \sqrt{9801}}{2}$$

$$= \frac{-9 \pm 99}{2}$$

$\frac{90}{2} = 45$ mph

$-\frac{108}{2} = -54$

#5

$\frac{\text{Price}}{\text{\# of people}}$

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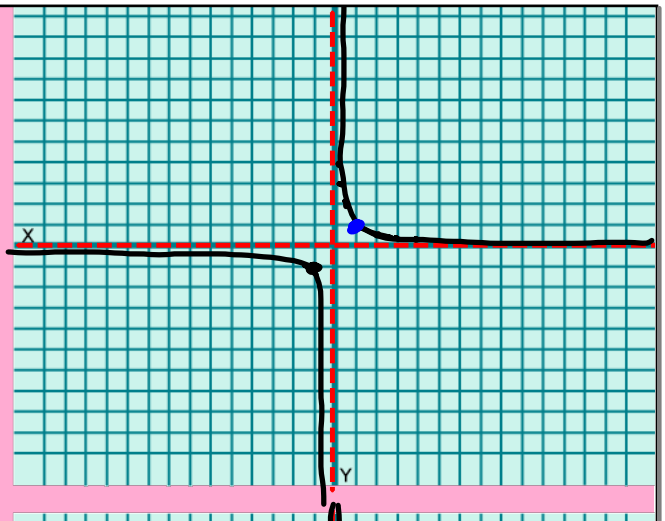
$y = \frac{1}{x}$

butterfly

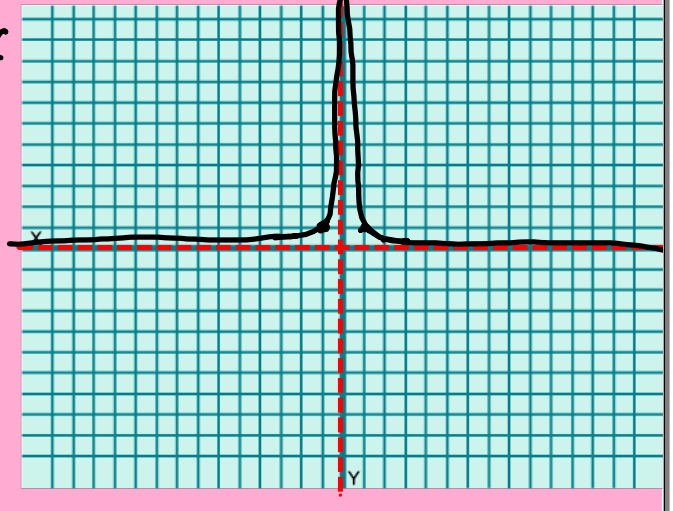
0	$\frac{1}{0}$ = undef
−1	$\frac{1}{-1} = -1$
−2	$\frac{1}{-2}$
−3	$\frac{1}{-3}$
−1/2	$\frac{1}{-1/2} = -2$
−1/3	$= 3$
−1/4	$= 4$



$y = \frac{1}{x^2}$

Butt crack

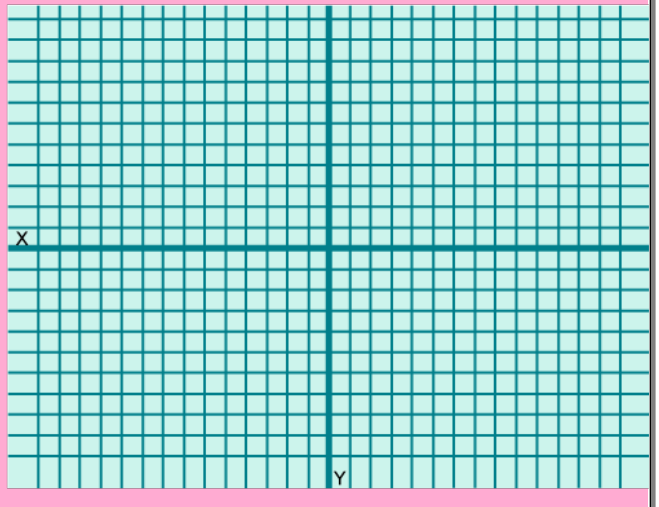
0	$\frac{1}{0^2}$ = undef
−1	$\frac{1}{-1^2} = +1$
−2	$\frac{1}{-2^2} = +\frac{1}{4}$
−3	$\frac{1}{-3^2} = +\frac{1}{9}$
−1/2	$\frac{1}{(-1/2)^2} = 4$
−1/3	$\frac{1}{(-1/3)^2} = 9$



$y = \frac{3}{x+4} + 1$

up

left 4

1	X	3

$3 \cdot \frac{1}{x}$