From Fall '19

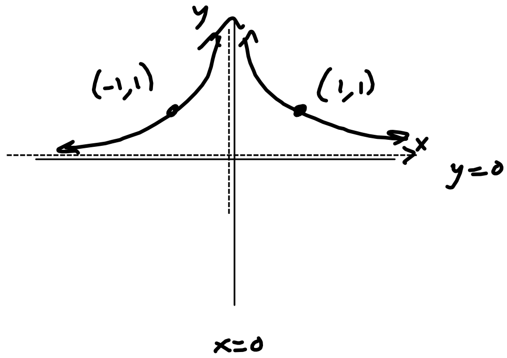
#1 $g(x)=\dfrac{3}{(5x-15)^2}-6$ is built from $f(x)=\dfrac{1}{x^2}$ ← FORGOT! (Almost)

Method 1's easier for beginners

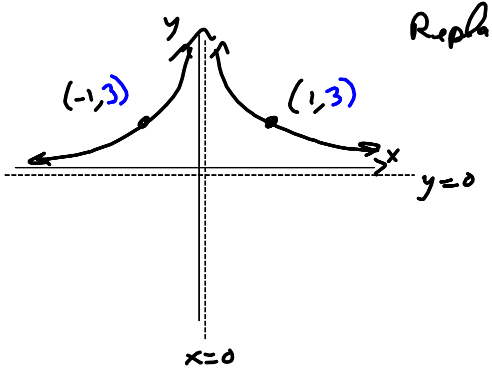
" 2's better for understanding phase, wavelength in trig, calc, & beyond.

<u>You</u> only need to do M1 <u>OR</u> M2, not both!

M1 ⓪ $f(x)=\dfrac{1}{x^2}$



① $3f(x)=\dfrac{3}{x^2}$ $(x,y)\longmapsto(x,3y)$

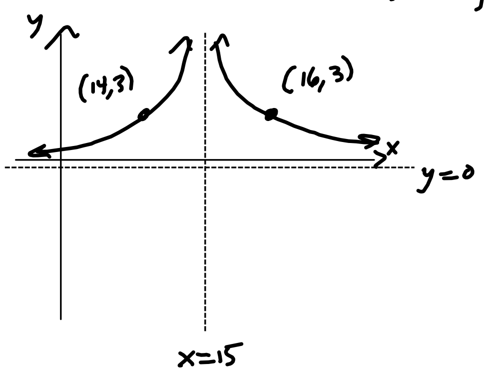


Replace $y=f(x)$ with $3y=3f(x)$

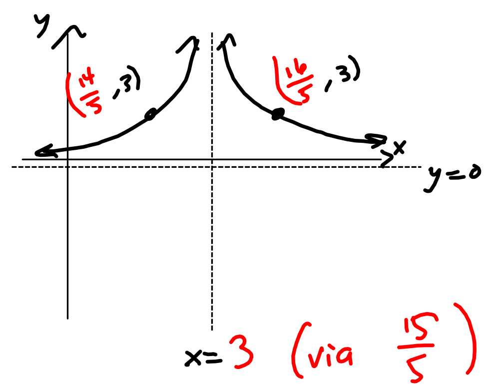
② $3f(x-15)$ $(x,y)\longmapsto(x+15,y)$

Replace x by $x-15$ inside function

That gives $x\longmapsto x+15$ in picture

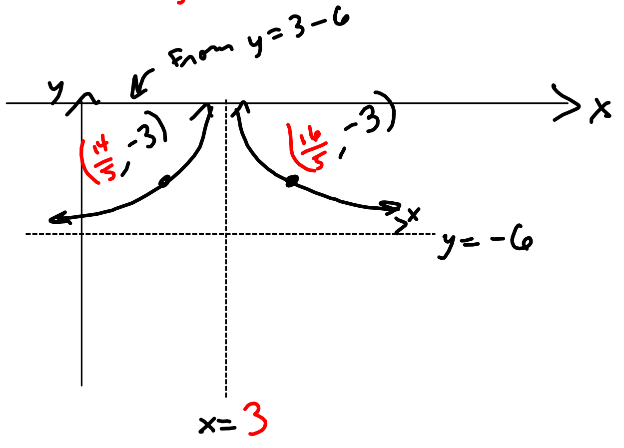


(3) $3f(5x-15)$ $(x,y) \longmapsto (\frac{1}{5}x, y)$



(4) $3f(5x-15)-6=g(x)$

$(x,y) \longmapsto (x, y-6)$



#1 in our Spring '22 WP #2 is

$g(x) = \frac{2}{5x+15} + 7$

You need to see the $f(x) = \frac{1}{x}$ "living inside"

$\frac{1}{x}$ (0) $\longrightarrow$ (1) $\frac{2}{x}$ $\longrightarrow$ (2) $\frac{2}{x+15}$ $\longrightarrow$ (3) $\frac{2}{5x+15}$ $\longrightarrow$ (4) $g(x)$

$(x,y) \mapsto (x, 2y)$
Vertical stretch factor of 2 from Pic (0)

$(x,y) \mapsto (x-15, y)$
Left 15 from Pic (1)

$(x,y) \mapsto (\frac{1}{5}x, y)$
Shrink towards y-axis by factor of 5.
("stretch" by factor of $\frac{1}{5}$)
from Pic (2)

Final Picture is $g(x)$

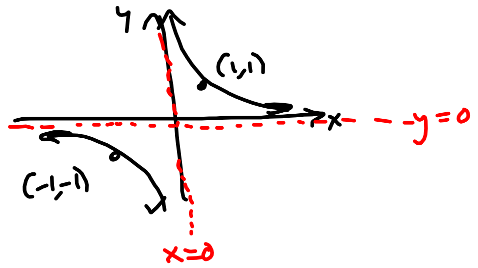
$= \frac{2}{5x+15} + 7 = g(x)$

Vertical SHIFT up 7

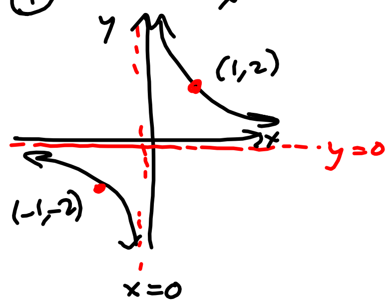
$(x,y) \mapsto (x, y+7)$ from Picture (3)

Always use previous graph as starting point for next graph

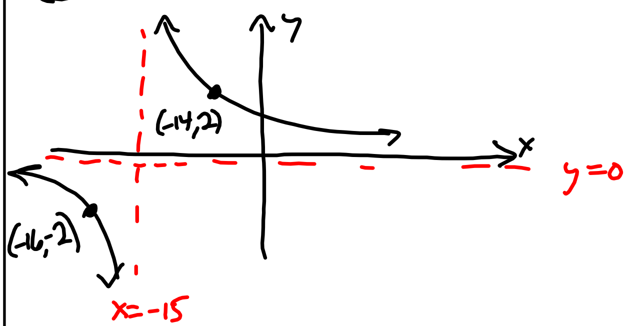
(0) $f(x) = \frac{1}{x}$



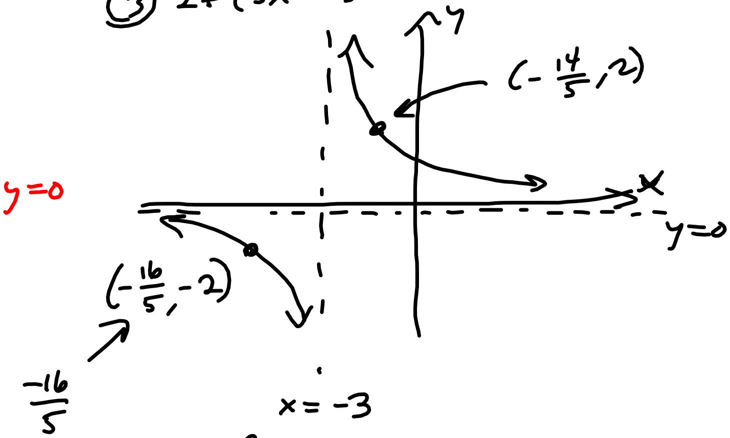
(1) $2f(x) = \frac{2}{x}$



(2) $2f(x+15)$



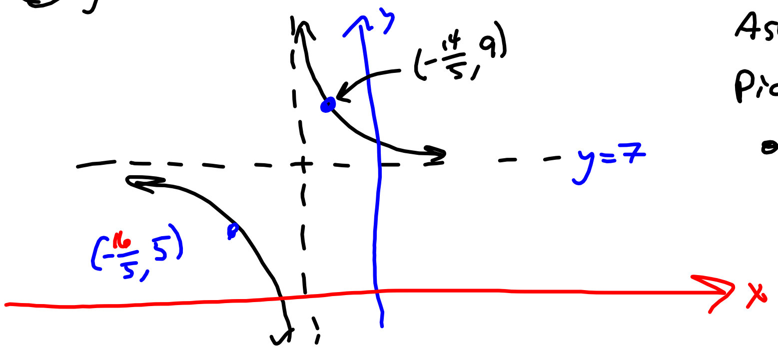
(3) $2f(5x+15)$

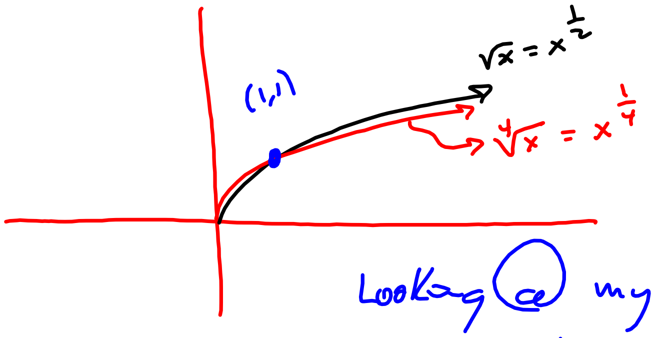


$x = -3$
(from $\frac{-15}{5} = -3$

4) $g(x) = 2f(5x+15) + 7$

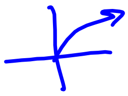
Asymptotes 1st
Picture's centered on "crosshairs"

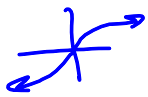




has $\sqrt{x}$ "shape" basically.

Looking @ my notes, I don't think I made the connection/equivalence of $\sqrt[2n]{x} = x^{\frac{1}{2n}}$

$\sqrt{x} = x^{\frac{1}{2}}$  $x^{\frac{1}{2}}, x^{\frac{1}{4}}, \ldots$

$\sqrt[3]{x} = x^{\frac{1}{3}}$  $x^{\frac{1}{5}}, x^{\frac{1}{7}}, \ldots$