Homework for ch14: Rational Functions

Turn in Problem #2 from this sheet and 14.1c and 14.5 from the book.

1) Take this rational function, $f(x) = \frac{1}{x}$, and perform the shift, the dilation, and the reflection to it as we did in chapter 13, using either Geogebra or Desmos (or similar). Throw some numbers on it and graph an example of each transformation. I want you to get a feel for the rational function:

$$f(x) = A + B\left(\frac{1}{x+K}\right), \qquad where\ A, B, and\ K\ are\ all\ constants.$$

What I want is for you to systematically put numbers in for A, B, and K and see what happens in a graphing program. I suggest you work with one constant at a time by making the other ones either 1 or 0 depending on the situation.

E.g. I'm shifting and dilating using a +3 and a -3 in this example.

a) Vertical Shift: $f(x) = \frac{1}{x} \pm 3$

b) Horizontal Shift: $f(x) = \frac{1}{(x \pm 3)}$

c) Y Dilation and Reflection because of that $\pm$: $f(x) = \pm 3\left(\frac{1}{x}\right)$

d) X Dilation and Reflection because of that $\pm$: $f(x) = \frac{1}{\pm 3(x)}$

Note: The reflections are shown by allowing the 3 to plus and then minus.

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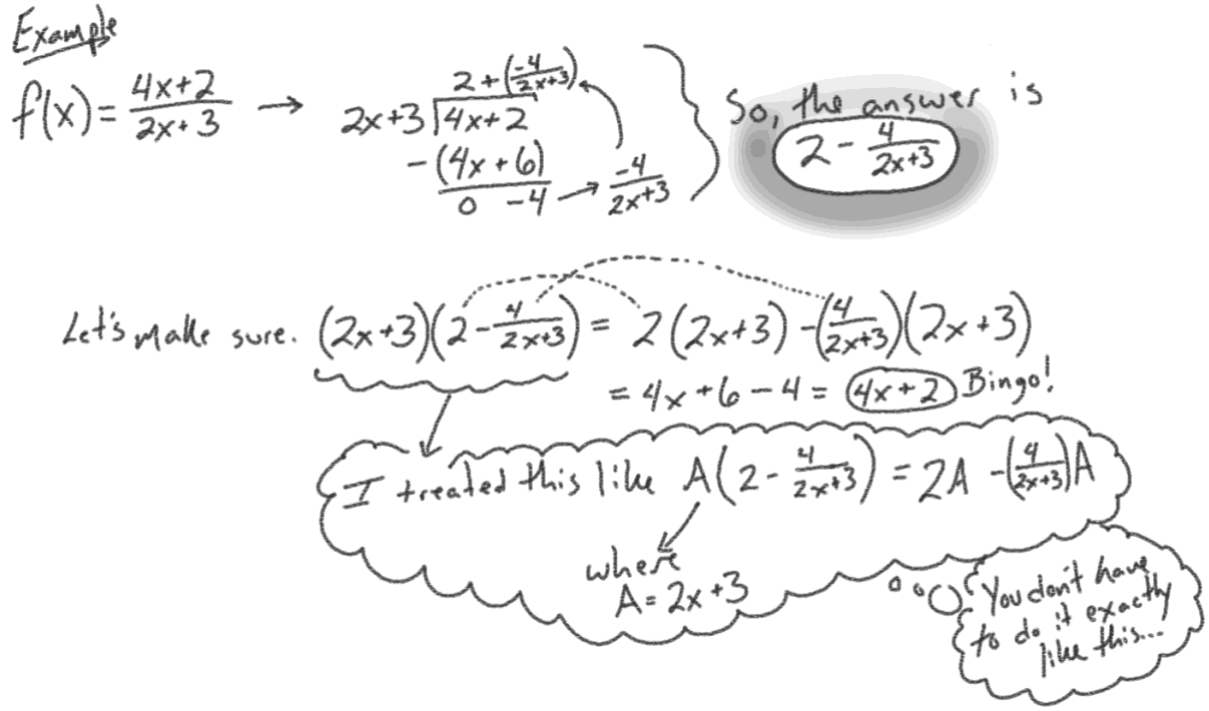
2) Divide the following expressions using the long division method. Here's an example.



a) $\frac{3x-5}{x}$

b) $\frac{15x+8}{5x+4}$

c) $\frac{0.25x+1}{0.125x-3}$

Answers: a) $3-\frac{5}{x}$, b) $3-\frac{4}{5x+4}$ c) $2+\frac{7}{0.125x-3}$.

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2) **To be turned in**: The lower part of p182 shows how the function, $f(x)=\frac{ax+b}{cx+d}$, is rewritten into $f(x)=A+B\left(\frac{1}{x+c}\right)$. This shows that a linear function divided by a linear function results in a single rational function.

For homework **to be turned in**, write up this algebraic nightmare, step-by-step, with commentary to the side that walks the reader through the math. I will be doing this in the video I post, so feel free to use the video as a guide. I'd like you to get a feel for all the algebraic tricks that are used.

Editor's Note: On p185 our book ammends its general form for a linear-linear rational function from

$$f(x)=\frac{ax+b}{cx+d} \quad \rightarrow \; to \; \rightarrow \quad f(x)=\frac{ax+b}{x+c}.$$

But these two equations are incompatable. The $a \neq a \; and \; the \; b \neq b, etc.$ Math textbooks love to reassign constants, but they don't seem to realize that it makes their books harder to use. Rather than dwell on my annoyance, let me just walk you through the transformation.

$$f(x)=\frac{ax+b}{cx+d} \;=\; \frac{(ax+b)\cdot\frac{1}{c}}{(cx+d)\cdot\frac{1}{c}} \;=\; \frac{\left(\frac{a}{c}x+\frac{b}{c}\right)}{\left(x+\frac{d}{c}\right)}.$$

And now I'll do something really stupid, but it will match up with the book.

$$Let\ \frac{a}{c} = \text{"}a\text{"},\ \ \frac{b}{c} = \text{"}b\text{"},\ \ and\ \frac{d}{c} = \text{"}c\text{"}.$$

Now we have the form shown on p185: $f(x) = \frac{ax+b}{x+c}$.

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3) Finally: Do problems 14.1, 14.5, 14.6, and 14.9 in the book. All parts.

Turn in 14.1c and 14.5.

I currently prefer .jpg files if this works for you.
If jpegs are a pain, feel free to use .pdf or .doc or .docx.

Answers and Solutions to Problem 2: a) $3 - \frac{5}{x}$, b) $3 - \frac{4}{5x+4}$ c) $2 + \frac{7}{0.125x-3}$.