Distribute Self-assessment

Return Formative 5.1 (and correct)

Last day's homework:
pp. 285-287 #3b, 4b (do not "verify"), 5c, 6abc, **9, 11 (see Example 4, text), **12
Challenge: #16 (use desmos).
Answer for #16a) should be: at 0.417 sec and 1.705 sec.

Legend:
** final answers must be stated as simplified exact values (not rounded!)

p. 286

9. The Greek mathematician Pythagoras is credited with the discovery of the Golden Rectangle. This is considered to be the rectangle with the dimensions that are the most visually appealing. In a Golden Rectangle, the length and width are related by the proportion $\frac{l}{w} = \frac{w}{l - w}$. A billboard with a length of 15 m is going to be built. What must its width be to form a Golden Rectangle?

Given length = 15 m, then substitute for length in proportion:

$$\frac{15}{w} = \frac{w}{15 - w}$$

Multiply both sides by the LCD, $w(15 - w)$

$$w(15 - w)\left(\frac{15}{w}\right) = w(15 - w)\left(\frac{w}{15 - w}\right)$$

$$(15 - w)(15) = w^2$$

$$225 - 15w = w^2$$

$$225 - 225 - 15w + 15w = w^2 + 15w - 225$$

$$0 = w^2 + 15w - 225$$

$$w^2 + 15w - 225 = 0$$

Solution manual had incorrect sign!

Use the quadratic equation to help you solve the quadratic formula.

$w = 9.271$ and $w = -24.27$

Since a width has to be positive, $w = 9.271$.

p. 287 **11.** Tayla purchased a large box of comic books for $300. She gave 15 of the comic books to her brother and then sold the rest on an Internet website for $330, making a profit of $1.50 on each one. How many comic books were in the box? What was the original price of each comic book?

Let n represent the original number of comic books in the box.

Let C represent the original price of each comic book, in dollars.

$$C = \frac{300}{n} \qquad \frac{330}{n-15} = C + 1.50$$

$$\frac{330}{n-15} - 1.50 = C$$

$$\therefore \frac{300}{n} = \frac{330}{n-15} - 1.50$$

$$n(n-15)\left[\frac{300}{n}\right] = n(n-15)\left[\frac{330}{n-15}\right] - n(n-15)[1.50]$$

$$300n - 4500 = 330n - 1.5n^2 + 22.5n$$

Bring to L.S. and set R.S. = 0

$$1.5n^2 - 52.5n - 4500 = 0$$

The roots are 75.00 and -40. Since you can't have a negative number of comics, the correct answer would be 75. The original price per comic would be $\frac{300}{75} = \$4$. The resale price per comic would be $\frac{300}{60} = \$5.50$.

5.5 Solving Rational Inequalities

Math Learning Target:

"I can solve any rational inequality, algebraically and graphically. I also know that division by zero is an invalid operation."

***Recall*: A Unit 4 Question**

Solve $\{x \in \mathbb{R}\}$: $\dfrac{2x+3}{-3} \geq x+5$

$2x+3 \leq -3(x+5)$ *Note: Sign Change

$2x+3 \leq -3x-15$

$2x \leq -3x-15-3$

$2x \leq -3x-18$

$2x+3x \leq -18$

$5x \leq -18$

$x \leq \dfrac{-18}{5}$

$\therefore x \in \left(-\infty, \dfrac{-18}{5}\right]$

$\therefore \left\{x \in \mathbb{R} \mid x \leq \dfrac{-18}{5}\right\}$

Ex. 1: Where is (are) the error(s) in the solution below?

Rest: $x \neq 0$

LCD $= x$

Solve $\{x \in \mathbb{R}\}$ where $x \neq 0$: $x - 2 < \dfrac{8}{x}$

$x - 2 - \dfrac{8}{x} < 0$

$\dfrac{x^2}{x} - \dfrac{2x}{x} - \dfrac{8}{x} < 0$

$x^2 - 2x < 8$	Multiply by x
$x^2 - 2x - 8 < 0$	Rearrange
$(x-4)(x+2) < 0$	Factor

$\dfrac{x^2-2x-8}{x} < 0$

Let $f(x) = (x-4)(x+2)$

$x = 4, x = -2$ Zeros

$\dfrac{(x-4)(x+2)}{x} < 0$

Factor Table

interval	$x < -2$	$-2 < x < 4, x \neq 0$	$x > 4$
sign of $f(x)$	+	-	-

Let $p(x) = x^2 - 2x - 8$

$q(x) = x$

$\therefore f(x) = \dfrac{p(x)}{q(x)}$

Hence, the solution is $\{x \in \mathbb{R} / -2 < x < 4, \text{where } x \neq 0 \text{ and } x > 4\}$.

Boundary Values: $x = 4, -2, 0$

$x < -2$	$-2 < x < 0$	$0 < x < 4$	$x > 4$
$\dfrac{(-)(-)}{(-)}$	$\dfrac{(-)(+)}{(-)}$	$\dfrac{(-)(+)}{(+)}$	$\dfrac{(+)(+)}{(+)}$
$= -$	$= +$	$= -$	$= +$
$\therefore$ Yes	$\therefore$ No	$\therefore$ Yes	$\therefore$ No

$\therefore \{x \in \mathbb{R} \mid x < -2 \text{ OR } 0 < x < 4\}$

$x \in (-\infty, -2) \cup (0, 4)$

Ex. 2: (p.296 #4d)

Use algebra to find the solution set for (each) inequality.
Verify your answer using graphing technology. (use desmos)

d) $\frac{7}{x-3} \geq \frac{2}{x+4}$

Restrictions: $x \neq 3, -4$

$\frac{7}{x-3} - \frac{2}{x+4} \geq 0$ LCD $= (x-3)(x+4)$

$\frac{7(x+4)-2(x-3)}{(x-3)(x+4)} \geq 0$

$\frac{7x+28-2x+6}{(x-3)(x+4)} \geq 0$

$\frac{5x+34}{(x-3)(x+4)} \geq 0$

$p(x) = 5x+34$
$q(x) = (x-3)(x+4)$
$f(x) = \frac{p(x)}{q(x)}$ find $f(x) \geq 0$

$\frac{5\left(x+\frac{34}{5}\right)}{(x-3)(x+4)} \geq 0$

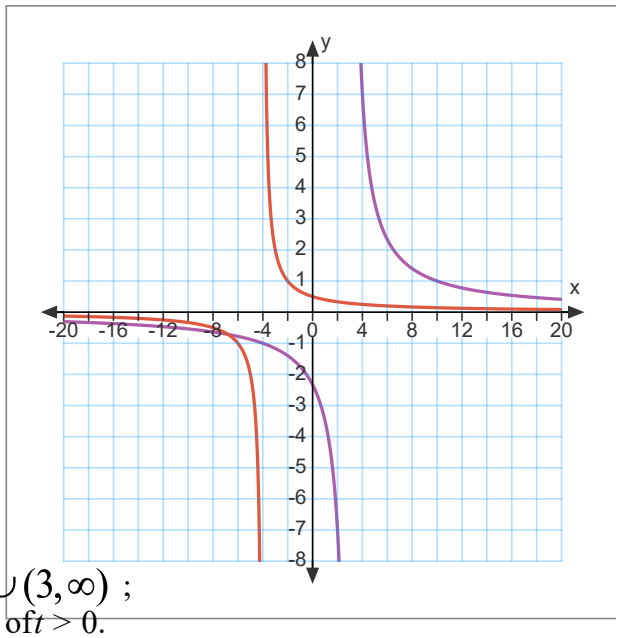
Boundary Values: $x = 3, -4, -\frac{34}{5}$ (-6.8)

$x < -\frac{34}{5}$	$-\frac{34}{5} < x < -4$	$-4 < x < 3$	$x > 3$
$\frac{(-)}{(-)(-)}$	$\frac{(+)}{(-)(-)}$	$\frac{(+)}{(-)(+)}$	$\frac{(+)}{(+)(+)}$
$= -$	$= +$	$= -$	$= +$
NO	Yes	NO	Yes

$x \in \left[-\frac{34}{5}, -4\right) \cup (3, \infty)$

* refer to restrictions

$y = \frac{7}{x-3}$ $y = \frac{2}{x+4}$



pp.295-297 #1*, 4**bf, 9@, 11***

*The answer is wrong for 1a). It should be $(-\infty, 1) \cup (3, \infty)$;

@ **Change the textbook** question to say $t \geq 0$ instead of $t > 0$.

The final answer should be [0, 0.31);

**no verification required;

***11) the final answer is: $1 < x < 5$

Challenge Yourself! #13, 15