

Without my notes I can...		Correct	Incorrect
Yes	No		
✓		✓	
<p>1. Factor a quadratic with an 'a' value not equal to one. $6x^2 + 7x - 3$ $a=6$ $b=7$ $c=-3$</p> <div style="text-align: center;"> </div> <p> $6x^2 - 2x + 9x - 3$ $(6x^2 - 2x) + (9x - 3)$ $2x(3x - 1) + 3(3x - 1)$ $(3x - 1)(2x + 3)$ </p>			
✓		✓	
<p>2. Identify the removable and essential discontinuities from a graph.</p> <div style="text-align: center;"> </div> <p> $\text{Removable} = \text{hole} \rightarrow x = -3$ $\text{Essential} = \text{asymptote} \rightarrow x = 3$ </p>			
✓		✓	
<p>3. Describe end behavior, asymptotic behavior, domain, and range of a rational function.</p> <div style="text-align: center;"> </div> <p> $g(x) = \frac{2(x-1)}{(x-1)(x-4)}$ $\text{hole at } x = 1$ $\text{asymptote at } x = 4$ $\text{As } x \rightarrow 4^-, y \rightarrow -\infty$ $\text{As } x \rightarrow 4^+, y \rightarrow \infty$ $\text{As } x \rightarrow \infty, y \rightarrow 0$ $\text{As } x \rightarrow -\infty, y \rightarrow 0$ $\text{domain } (-\infty, 1) \cup (1, 4) \cup (4, \infty)$ $\text{range } (-\infty, 0) \cup (0, \infty)$ </p> <p><i>Does not apply</i> <i>This is the wrong graph!</i></p>			

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4. Determine essential and removable discontinuities of a rational expression from factored form.

$$g(x) = \frac{2(x+2)(x-1)}{(x-1)(x-4)}$$

Removable (hole) $x-1=0$
 $x=1$
Essential (asymptote) $x-4=0$
 $x=4$

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5. Add rational expressions. List any restrictions on the domain.

a. $\frac{(3x-5)}{x+2} + \frac{2x+3}{x+2} = \frac{3x-5+2x+3}{x+2} = \frac{5x-2}{x+2}$

$x+2 \neq 0$
 $x \neq -2$
LCD = $x+2$

b. $\frac{2x}{3x-2} + \frac{6}{x+1}$

$3x-2 \neq 0$
 $3x \neq 2$
 $x \neq \frac{2}{3}$
 $x+1 \neq 0$
 $x \neq -1$

LCD = $(3x-2)(x+1)$
 $\frac{2x(x+1)}{LCD} + \frac{6(3x-2)}{LCD}$

$\frac{2x^2+20x-12}{(3x-2)(x+1)}$

$\frac{2x^2+2x}{LCD} + \frac{18x-12}{LCD} = \frac{2x^2+20x-12}{LCD}$
 $2(x^2+10x-6)$

6. Subtract rational expressions. List any restrictions on the domain.

a. $\frac{4-x}{(x+2)(2x-1)} - \frac{3+4x}{(x+2)(2x-1)}$

$\frac{4-x}{LCD} - \frac{3+4x}{LCD} =$

$\frac{4-x-(3+4x)}{LCD} \rightarrow$

$\frac{4-x-3-4x}{LCD} =$

$\frac{1-5x}{(x+2)(2x-1)}$

LCD = $(x+2)(2x-1)$

$x+2 \neq 0$
 $x \neq -2$
 $2x-1 \neq 0$
 $2x \neq 1$
 $x \neq \frac{1}{2}$

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

$$\frac{(x+3)(x-4)}{LCD} - \frac{(2x+7) \cdot 3x}{LCD} = \frac{x^2+3x-4x-12}{LCD} - \frac{6x^2+21x}{LCD} = \frac{x^2-x-12-(6x^2+21x)}{LCD}$$

$$\frac{x^2-x-12-6x^2-21x}{LCD} = \frac{-5x^2-22x-12}{3x(x-4)}$$

7. Multiply rational expressions. List any restrictions on the domain.

a. $\frac{8x(x+4)}{(x-3)(x+2)} \cdot \frac{(x+4)(x+2)}{x+2 \neq 0}$

$$\frac{8x(x+4)(x+2)}{(x-3)(x+2)} \rightarrow \frac{8x(x+4)^2}{x-3}$$

$$\frac{3(x^2-2x-8)}{(x-3)(x+1)} \cdot \frac{(x-3)}{6x(x+2)}$$

$$\frac{3(x-4)(x+2)}{2 \cdot 6x(x+2)(x+1)} = \frac{x-4}{2x(x+1)}$$

Restrictions: $x \neq 3, x \neq -2, x+2 \neq 0, x+1 \neq 0, x-3 \neq 0, x+1 \neq 0$

b. $\frac{3x^2-6x-24}{x^2-2x-3} \cdot \frac{x-3}{6x^2+12x}$

$$\frac{3(x-4)(x+2)}{(x-3)(x+1)} \cdot \frac{(x-3)}{2 \cdot 6x(x+2)} = \frac{(x-4)(x+2) \cdot 2 \cdot (x-3)(x+2)}{x(x-3)(x+4)} = \frac{2(x+2)^2}{x(x-4)}$$

Restrictions: $x \neq 0, x-3 \neq 0, x+2 \neq 0, x-4 \neq 0, x \neq 3, x \neq -2, x \neq 4$

b. $\frac{2x^2+3x-2}{6x^2-24x} \div \frac{2x^2-3x+1}{3x-12}$

$$\frac{(2x-1)(x+2)}{6x(x-4)} \div \frac{(2x-1)(x-1)}{3(x-4)}$$

$$\frac{(2x-1)(x+2)}{6x(x-4)} \cdot \frac{3(x-4)}{(2x-1)(x-1)} = \frac{1 \cdot 3(x+2)}{2 \cdot 6x(x-1)(x-1)} = \frac{(x+2)}{2x(x-1)}$$

Restrictions: $x \neq 0, x-3 \neq 0, x-4 \neq 0, x \neq 3, x-1 \neq 0, 2x-1 \neq 0, 2x \neq 1, x \neq 1, x \neq \frac{1}{2}$

Sorry so squished!

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9. Solve rational functions in context.

a. One pipe can fill a pool 1.25 times faster than a second pipe. When both pipes are opened, they fill the pool in 5 hours. How long would it take to fill the pool if only the slower pipe is used?

Pipe 1	X	$\frac{1}{X}$	rate
Pipe 2	1.25X	$\frac{1}{1.25X}$	
Together	5	$\frac{1}{5}$	

$$\frac{1}{X} + \frac{1}{1.25X} = \frac{1}{5}$$

$$\frac{5X}{X} + \frac{5X}{1.25X} = \frac{5X}{5}$$

$$1.00 = 5X$$

$$1.25(4) = 11.25 \text{ hours}$$

$$5 + 4 = X = 9 \leftarrow \text{fastest}$$

b. Working together, Bill and Tom painted a fence in 8 hours. Last year, Tom painted the fence by himself. The year before, Bill painted it by himself, but took 12 hours less than Tom took. How long did Bill and Tom take, when each was painting alone?

Time	rate
12 hrs = Bill	$\frac{1}{X-12}$
24 hrs = Tom	$\frac{1}{X}$
Together 8	$\frac{1}{8}$

$$\frac{1}{X-12} + \frac{1}{X} = \frac{1}{8}$$

$$\frac{8X(X-12)}{X(X-12)} + \frac{8(X-12)}{X(X-12)} = \frac{8(X-12)}{8(X-12)}$$

$$\frac{8X + 8(X-12) - 96}{8X + 8X - 96} = \frac{8(X-12)}{8(X-12)}$$

$$X^2 - 28X + 96 = 0$$

$$(X-4)(X-24) = 0$$

$$X-4=0 \quad X-24=0$$

$$X=4 \quad X=24$$

c. Jamie has won 8 out of 15 golf tournaments this season. How many more consecutive golf tournaments would Jamie have to win in order to improve her winning percentage to 65%?

Current Avg $\frac{8}{15} \approx 0.53$

Jamie needs to win 5 more

$$\frac{8+X}{15+X} = 0.65$$

$$(15+X) \cdot \frac{8+X}{(15+X)} = 0.65(15+X)$$

$$8+X = 9.75 + 0.65X$$

$$X = 1.75 + 0.65X$$

$$-0.65X$$

$$0.35X = 1.75$$

$$\frac{0.35X}{0.35} = \frac{1.75}{0.35}$$

$$X = 5$$

10. Solve rational functions. Check for any extraneous solutions.

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

Check:

$$\frac{3}{\frac{4}{3}+1} = \frac{1}{\left(\frac{4}{3}\right)^2-1}$$

$$\frac{3}{\frac{7}{3}} = \frac{1}{\frac{16-9}{9}}$$

$$\frac{9}{7} = \frac{9}{7}$$

$X \neq -1$ $X \neq 1$

$$LCD = (x-1)(x+1)$$

$$\frac{3(x-1)(x+1)}{(x+1)} = \frac{1(x-1)(x+1)}{(x-1)(x+1)}$$

$$3(x-1) = 1$$

$$3x - 3 = 1$$

$$3x = 4$$

$$x = \frac{4}{3}$$