Math 172 – Quiz #5

November 29, 2013 **Name:** _____
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Show all work to get full credit. Total: 40 points

1. State the domain of the following rational expression in either set-builder notation or interval notation. (3 points)

$$\frac{y}{2y^2-72}$$

$$= \frac{y}{2(y^2-36)}$$

$$= \frac{y}{2(y-6)(y+6)}$$

$\{y \mid y \neq 6 \text{ and } y \neq -6\}$

OR $(-\infty, -6) \cup (-6, 6) \cup (6, \infty)$

2. Reduce each rational expression to lowest terms. (6 points)

a) $\dfrac{6y^{2x+1}+12y^{2x}}{42y+84}$

$$= \frac{6y^{2x}(y+2)}{7 \cdot 6(y+2)}$$

$$= \frac{y^{2x}}{7}$$

$\dfrac{y^{2x}}{7}$

b) $\dfrac{2b^2+2b-4}{b^2+2b-3}$

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

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

$\dfrac{2(b+2)}{b+3}$

3. Perform the indicated operations. Express your answer in lowest terms. (7 points)

a) $\frac{2r-4}{3r-3} \div \frac{3r^2-4r-4}{r-r^2}$ ← multiply by the reciprocal

$= \frac{2(r-2)}{3(r-1)} \times \frac{r(1-r)(-1)}{(3r+2)(r-2)}$

$= \frac{-2r}{3(3r+2)}$

$3r^2-4r-4$ ac method

$= 3r^2-6r+2r-4$

$= 3r(r-2)+2(r-2)$

$= (3r+2)(r-2)$

$\frac{-2r}{3(3r+2)}$

b) $\frac{k}{k^2-4} - \frac{1}{k^2-2k}$

LCD $= (k-2)(k+2)k$

$= \frac{k}{(k-2)(k+2)} - \frac{1}{k(k-2)}$

$= \frac{k^2}{k(k-2)(k+2)} - \frac{(k+2)}{k(k-2)(k+2)}$

$= \frac{k^2-k-2}{k(k-2)(k+2)}$

$= \frac{(k-2)(k+1)}{k(k-2)(k+2)} = \frac{k+1}{k(k+2)}$

$\frac{k+1}{k(k+2)}$

4. Find the quotient and remainder of $\frac{2x^3-3x^2+6}{x^2-1}$. Is x^2-1 a factor of $2x^3-3x^2+6$?

(5 points)

$$\begin{array}{r} 2x-3 \\ x^2-1 \;\overline{)\; 2x^3-3x^2+0x+6} \\ -(2x^3 \qquad -2x) \\ \hline -3x^2+2x+6 \\ -(-3x^2 \qquad +3) \\ \hline 2x+3 \end{array}$$

quotient: $2x-3$

remainder: $2x+3$

factor? NO

remainder $\neq 0$

5. Find the solution set for the following equations. (9 points)

a) $\frac{5}{2x-2}-\frac{1}{x+3}=\frac{1}{x-1}$ LCD $= 2(x-1)(x+3)$ $\{-11\}$

$2(x-1)$

(4)

$2(x-1)(x+3)\left[\frac{5}{2(x-1)}-\frac{1}{x+3}\right]=\frac{1}{x-1}\cdot 2(x-1)(x+3)$

$5(x+3)-2(x-1)=2(x+3)$

$5x+15-2x+2=2x+6$

$x+17=6$

$x=-11$

Check $x=-11$:

$LS=\frac{5}{-24}-\frac{1}{-8}=\frac{-5}{24}+\frac{3}{24}=\frac{-2}{24}$

$RS=\frac{1}{-12}$ ✓

b) $\frac{4}{y+1}+\frac{8}{y^2-1}=-1$ LCD $=(y+1)(y-1)$ $\{-3\}$

$(y-1)(y+1)$

(5)

$(y+1)(y-1)\left[\frac{4}{y+1}+\frac{8}{(y-1)(y+1)}\right]=-1\cdot(y+1)(y-1)$

$4(y-1)+8=-(y^2-1)$

$4y-4+8=-y^2+1$

$y^2+4y+3=0$

$(y+1)(y+3)=0$

$y=-1$ $y=-3$

Check $y=-1$:

LS = undefined

×

Check $y=-3$:

$LS=\frac{4}{-2}+\frac{8}{8}=-2+1$

$RS=-1$ ✓

$y=-1$ is an extraneous solution

6. Simplify the following complex fraction. (4 points)

$$\frac{\left(\frac{2x}{x+3}-\frac{x}{x-2}\right)}{\left(\frac{x}{x+3}-\frac{2x}{2-x}\right)}$$

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

$$= \frac{2x(x-2)-x(x+3)}{x(x-2)-2x(x+3)(-1)}$$ ← watch sign!

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

$$= \frac{2x^2-4x-x^2-3x}{x^2-2x+2x^2+6x}$$

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

$$= \frac{x(x-7)}{x(3x+4)}$$

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

$\frac{x-7}{3x+4}$

7. Some tourists in Victoria want to take a tour of the harbour in one of the harbour ferries. They are quoted a group rate of $36. Just before they set off, two more people decide to join the tour. If the cost per person decreases by $3 due to these new people, how many tourists were there originally? (6 points)

Let x = original # of tourists

$x+2$ = # in larger group

$/person

$$\frac{36}{x} = \frac{36}{x+2} + 3$$

LCD = $x(x+2)$

$$x(x+2)\cdot\frac{36}{x} = \left[\frac{36}{x+2}+3\right]\cdot x(x+2)$$

$$36(x+2) = 36x + 3x(x+2)$$

$$36x+72 = 36x+3x^2+6x$$

$$0 = 3x^2+6x-72$$

$$0 = 3(x^2+2x-24)$$

$$0 = 3(x+6)(x-4)$$

$$x = -6, 4 \quad (x=4)$$

there were originally 4 tourists.