Math 172 – Quiz #5

November 29, 2013 **Name:** Solitrian Set

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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)

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

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

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

$2y^2 - 72 = 0$

$y^2 - 36 = 0$

$(y-6)(y+6) = 0$

$y = \pm 6$

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

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

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

$\dfrac{6y^{2x}(y+2)}{42(y+2)}$

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

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

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

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

$2b^2+2b-4$

$2(b^2+b-2)$

$2(b+2)(b-1)$

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

a) $\dfrac{2r-4}{3r-3} \div \dfrac{3r^2-4r-4}{r-r^2}$

$\dfrac{2r-4}{3r-3} \cdot \dfrac{r-r^2}{3r^2-4r-4}$

$\dfrac{2(r-2)}{3(r-1)} \cdot \dfrac{r(1-r)}{(3r+2)(r-2)}$

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

$3r^2-4r-4$ $\quad ac=-12$

$3r^2-6r+2r-4$ $\quad 1\ 12$, $-2\ 6$, $3\ 4$

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

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

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

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

$\dfrac{k \cdot k}{k(k-2)(k+2)} - \dfrac{1 \cdot (k+2)}{k(k-2)(k+2)}$

$\dfrac{k^2-(k+2)}{k(k-2)(k+2)}$

$\dfrac{k^2-k-2}{k(k-2)(k+2)}$

$\dfrac{(k-2)(k+1)}{k(k-2)(k+2)}$

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

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

4. Find the quotient and remainder of $\dfrac{2x^3-3x^2+6}{x^2-1}$. Is x^2-1 a factor of $2x^3-3x^2+6$? (5 points)

$x^2-1 \;\overline{)\; 2x^3-3x^2+0x+6}$ $\quad 2x-3$

$2x^3 \quad -2x$

$-3x^2+2x+6$

$-3x^2 \quad +3$

$2x+3$

quotient: $2x-3$

remainder: $2x+3$

factor? no

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

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

$\{-11\}$

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

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

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

$x = -11$

check:

$\frac{5}{-24} - \frac{1}{-8} = \frac{1}{-12}$

$-\frac{5}{24} + \frac{3}{24} = -\frac{2}{24}$ ✓

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

$\{-3\}$

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

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

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

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

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

$y = \cancel{-1}, -3$

check:

$y=-1$

$\frac{4}{0} + \frac{8}{0} = -1$ ×

extraneous

$y=-3$

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

$-2+1=-1$ ✓

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

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

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

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

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

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

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

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

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

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)

	cost	=	cost/person	·	# people
originally	36		$36/n$		n
two more	36		$36/n+2$		$n+2$

$$n(n+2)\left(\frac{36}{n}\right) = \left(\frac{36}{n+2}+3\right)^{n(n+2)}$$

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

$$12(n+2) = 12n + n(n+2)$$

$$12n+24 = 12n + n^2+2n$$

$$0 = n^2+2n-24$$

$$= (n+6)(n-4)$$

$$n = \cancel{-6}, 4$$

There were 4 tourists initially.