MAT 099 - Summer 2015 - Test4

Instructor: **Dr. Francesco Strazzullo** Name KEY

Instructions. Only calculators are allowed on this examination. Each problem is worth 10 points. Always use the appropriate wording and units of measure in your answers (when applicable).
SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).

1. Perform the indicated operation on the rational expressions and reduce your answer to lowest terms.

PRODUCT = 2 < 1, 2
SUM = 4
NON-FACTORABLE

$$\frac{75(3x+1)(x+2)}{64(x^2+4x+2)} \cdot \frac{36(2x-4)(x+1)}{25(3x^2+4x+1)}$$

PRODUCT = 3 < 3, 1
SUM = 4

$3x^2+3x+x+1 = (3x+1)(x+1)$

$$= \frac{3\cdot \cancel{25}\cdot \cancel{4}\cdot 9}{8\cancel{16}\cdot\cancel{4}\cdot\cancel{25}} \frac{\cancel{(3x+1)}(x+2)}{(x^2+4x+2)} \frac{\cancel{2}(x-2)\cancel{(x+1)}}{\cancel{(3x+1)}\cancel{(x+1)}}$$

$$= \frac{27(x+2)(x-2)}{8(x^2+4x+2)}$$

2. Perform the indicated operation on the rational expressions and reduce your answer to lowest terms.

NON-FACTORABLE BY RATIONALS

$$\frac{z^2-4z-5}{z^2-5} \div \frac{z^2+2z+1}{z^2-2z+1}$$

$\to (z+1)^2$

$\to (z-1)^2$

$$\frac{(z-5)(z+1)}{z^2-5} \cdot \frac{(z-1)^2}{(z+1)^2} = \frac{(z-5)(z-1)^2}{(z^2-5)(z+1)}$$

3. Perform the indicated operation on the two rational expressions and reduce your answer to lowest terms.

$$\frac{3x^2}{x^2-5x+6} - \frac{6}{x+3} = \frac{3x^2}{(x-2)(x-3)} - \frac{6}{x+3}$$

$LCD = (x-2)(x-3)(x+3)$

$$\frac{3x^2(x+3)-6(x^2-5x+6)}{(x-2)(x-3)(x+3)} = \frac{3x^3+9x^2-6x^2+30x-36}{(x-2)(x-3)(x+3)}$$

$$= \frac{3x^3+3x^2+30x-36}{(x-2)(x-3)(x+3)} = \frac{3(x^3+x^2+10x-12)}{(x-2)(x-3)(x+3)}$$ NOT-FACTORABLE

4. Solve the following equation and simplify your answer. You must list and consider any restriction(s) on the variable, but you do not need to check the solutions. If the equation has no solution, write "No Solution." If a restriction is not needed, write "No Restriction."

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

RESTRICTED VALUES: $X+3=0 \to X=-3$; $X+1=0 \to X=-1$; $\boxed{X \neq -3, -1}$

$LCD = (X+3)(X+1)$

MULTIPLYING BY LCD: $2X + X(X+1) = 2(X+3) \to$

$\to 2X + X^2 + X = +2X + 6 \to X^2 + X - 6 = 0$

$-2X \quad -6 \quad -2X \quad -6$

PRODUCT $= -6$, SUM $= 1$

$\to (X+3)(X-2) = 0$

$X+3=0 \to X=-3 \to$ RESTRICTED

$X-2=0 \to X=2$

SOLUTION: $X = 2$

5. The volume of a spherical ball varies directly as the cube of its radius. If the volume of the ball is 7238.23 cubic inches when the radius is 12 inches, what will be its volume if the radius decreases to 9 inches? (Round off your answer to the nearest hundredth.)

$V = KR^3$

PLUG DATA: $V = 7238.23$, $R = 12$ $\to 7238.23 = K \cdot 12^3 \to$

$\to K = \frac{7238.23}{12^3} \approx 4.1888 \to V = 4.1888(9)^3 \approx 3053.63$ CUBIC INCHES

PLUG $R = 9$

6. Maria and Clair, working together, can count 1500 \$1 bills in 12 minutes. Working alone, Maria counts the same amount of bills in 10 minutes more than Clair does. How long does it take Clair to count 1500 \$1 bills alone?

	TIME = T	WORK RATE 1/T
MARIA	$X+10$	$\frac{1}{X+10}$
CLAIR	X	$\frac{1}{X}$
TEAM	12	$\frac{1}{12}$

$$\frac{1}{X+10} + \frac{1}{X} = \frac{1}{12}$$

RESTRICTED VALUES: $X = -10, 0$
DON'T APPLY TO CONTEXT.

$LCD = 12X(X+10)$

MULTIPLY BY LCD:

$12X + 12(X+10) = X(X+10)$

$$12X + 12X + 120 = X^2 + 10X$$
$$-24X \quad -120 \qquad\qquad -24X - 120$$

$$X^2 - 14X - 120 = 0$$
$$(X-20)(X+6) = 0$$

$X = -6$ OUT OF CONTEXT.

$X = 20.$

IT WILL TAKE CLAIR 20 minutes TO COUNT 1500 \$1 BILLS.

7. Simplify the expression by combining the radical terms using the indicated operation(s).

$\sqrt[3]{\ }$ CUBIC ROOT.

$$y^2\sqrt[3]{250x^7y} + 2x\sqrt[3]{128x^4y^7} - x^2y\sqrt[3]{686xy^4}$$

$$= y^2\sqrt[3]{5^3\cdot 2}\sqrt[3]{x^6x}\sqrt[3]{y} + 2x\sqrt[3]{4^3\cdot 2}\sqrt[3]{x^3x}\sqrt[3]{y^6y} - x^2y\sqrt[3]{7^3\cdot 2}\sqrt[3]{x}\sqrt[3]{y^3y}$$

$$= y^2\cdot 5\sqrt[3]{2}\cdot x^2\sqrt[3]{x}\sqrt[3]{y} + 2x\cdot 4\sqrt[3]{2}\cdot x\cdot\sqrt[3]{x}\cdot y^2\sqrt[3]{y} - x^2y\cdot 7\cdot\sqrt[3]{2}\cdot\sqrt[3]{x}\cdot y\sqrt[3]{y}$$

$$= 5x^2y^2\sqrt[3]{2xy} + 8x^2y^2\sqrt[3]{2xy} - 7x^2y^2\sqrt[3]{2xy}$$

$$= 6x^2y^2\sqrt[3]{2xy}$$

8. Simplify the following radical number.

$$\frac{75 - 3\sqrt{125}}{60}$$

$$= \frac{3(25 - \sqrt{5^2\cdot 5})}{60} = \frac{25 - 5\sqrt{5}}{20} = \frac{5(5-\sqrt{5})}{20}$$

$$= \frac{5-\sqrt{5}}{4}$$

9. Find the distance between the points $(-1, 6)$ and $(2, 5)$. (Use a simplified radical number.)

$$d((x_1, y_1), (x_2, y_2)) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$= \sqrt{(-1-2)^2 + (6-5)^2} = \sqrt{(-3)^2 + 1^2} = \sqrt{10}$$

10. Using the square-root property, solve the quadratic equation

$$3(x-4)^2 = 39$$

$$(x-4)^2 = \frac{39}{3} \rightarrow \sqrt{(x-4)^2} = \pm\sqrt{13} \rightarrow$$

$$\rightarrow x - 4 = \pm\sqrt{13} \rightarrow x = 4 \pm \sqrt{13}$$

$$x = 4 - \sqrt{13}, \quad x = 4 + \sqrt{13}$$