MATH 410 PRACTICE FINAL October 7, 2015

Name: KEY Score: _____ / 100

Student ID: _____

DO NOT OPEN THE EXAM UNTIL YOU ARE TOLD TO DO SO

	1	2	3	4	5	6	7	8	9	10	11	12	Total
✓													
Score													

INSTRUCTIONS FOR STUDENTS

- Questions are on both sides of the paper. This is an 11 question exam (One extra credit problem can be attempted for a total of 12 questions).
- Students have 2 hours and 15 minutes to complete the exam.
- **PLEASE SHOW ALL WORK**. Any unjustified claims will receive no credit. Clearly box your final answer.
- You **MUST** complete **11** problems for credit. In the above table in the row with the ✓, please mark with a ✓ which problems you want to be graded. If you wish to do a 12^{th} problem for extra credit, please write *EC* in the ✓ row for the problem you wish to be counted for extra credit.
- No notes, textbooks, phones, calculators, etc. are allowed for the exam.
- Each of the 11 questions you choose to do will be graded out of 3 points. The score will then be totaled and multiplied by 3 to get a raw score out of 99 points. One point will be given for clearly writing your name on the exam sheet. This will get you to 100 points. If you choose to do a 12^{th} problem for extra credit, the most that will be awarded for that question will be 3 points. So, the highest possible score on this examination is 103 points out of 100.
- The back of the test can be used for scratch work.

GOOD LUCK!

1) Simplify the following expression completely

$$\frac{x^2+8x+15}{x^2-2x-35}$$

$$= \frac{(x+5)(x+3)}{(x-7)(x+5)} = \boxed{\frac{x+3}{x-7}}$$

2) Perform the indicated operation and simplify completely:

$$\frac{x^2+x}{3x-15} \div \frac{(x+1)^2}{6x-30}$$

$$= \frac{x(x+1)}{3(x-5)} \div \frac{(x+1)(x+1)}{6(x-5)}$$

$$= \frac{x(x+1)}{1\,3(x-5)} \cdot \frac{{}^{2}6(x-5)}{(x+1)(x+1)} = \boxed{\frac{2x}{x+1}}$$

3) Perform the operations and simplify completely:

$$\frac{x^2-81}{2x-6}-\frac{x^2-41}{2x-6}$$

Same denominators, subtract across

$$\Rightarrow = \frac{x^2-81-(x^2-41)}{2x-6}$$

$$= \frac{-40}{2(x-3)}$$

$$= \boxed{-\frac{20}{x-3}}$$

4) Perform the operations and simplify completely:

$$\frac{10x}{x+4}+x$$

$$= \frac{10x}{x+4} + \frac{x}{1}\cdot\frac{(x+4)}{(x+4)}$$

$$= \frac{10x}{x+4} + \frac{x^2+4x}{x+4}$$

$$= \frac{10x+x^2+4x}{x+4}$$

$$= \frac{x^2+14x}{x+4}$$

$$= \boxed{\frac{x(x+14)}{x+4}}$$

5) Perform the operations and simplify:

$$\frac{3x}{x^2-3x-10} - \frac{x-4}{x^2-2x-15}$$

$$= \frac{3x}{(x-5)(x+2)} - \frac{x-4}{(x-5)(x+3)}$$

LCD is $(x-5)(x+2)(x+3)$

$$\Rightarrow = \frac{(x+3)}{(x+3)} \cdot \frac{3x}{(x-5)(x+2)} - \frac{(x+2)}{(x+2)} \cdot \frac{(x-4)}{(x+3)(x-5)}$$

$$= \frac{3x^2+9x-(x+2)(x-4)}{(x+3)(x+2)(x-5)}$$

$$= \frac{3x^2+9x-x^2+2x+8}{(x+3)(x+2)(x-5)} = \boxed{\frac{2x^2+11x+8}{(x-5)(x+2)(x+3)}}$$

6) Simplify the complex fraction completely:

$$\frac{\frac{1}{4}-\frac{1}{x}}{\frac{x}{5}+\frac{1}{3}}$$

$$= \frac{\frac{x}{x}\cdot\frac{1}{4}-\frac{4}{4}\cdot\frac{1}{x}}{\frac{3}{3}\cdot\frac{x}{5}+\frac{5}{5}\cdot\frac{1}{3}}$$

LCD top is $4x$

LCD bottom is 15

$$= \frac{\frac{x}{4x}-\frac{4}{4x}}{\frac{3x}{15}+\frac{5}{15}} = \frac{\frac{x-4}{4x}}{\frac{3x+5}{15}} = \frac{x-4}{4x}\cdot\frac{15}{3x+5}$$

$$= \boxed{\frac{15(x-4)}{4x(3x+5)}}$$

7) Simplify the complex fraction completely:

$$\frac{4}{2+\frac{1}{x+2}} \longrightarrow \text{LCD is } x+2$$

$$= \frac{\frac{4}{1}}{\frac{2(x+2)}{x+2}+\frac{1}{x+2}} = \frac{\frac{4}{1}}{\frac{2x+5}{x+2}} = \frac{4}{1}\cdot\frac{x+2}{2x+5}$$

$$= \boxed{\frac{4(x+2)}{2x+5}}$$

8) Solve the following equation for x:

$$x - \frac{12}{x} = 4$$

$$\Rightarrow \frac{x}{x}\cdot\frac{x}{1} - \frac{12}{x} = \frac{4}{1}\frac{x}{x}$$

$$\Rightarrow \frac{x^2}{x} - \frac{12}{x} = \frac{4x}{x}$$

$$\Rightarrow \frac{x^2-12}{x} = \frac{4x}{x}$$

$$\Rightarrow \frac{x^2-12-4x}{x} = 0$$

$$\Rightarrow x^2-4x-12 = 0$$

$$(x-6)(x+2) = 0$$

$$\boxed{x=6,\ x=-2}$$

9) Solve the following equation for x:

$$\frac{7}{x+2}+\frac{5}{x-2}=\frac{10x-2}{x^2-4}$$

$$\frac{(x-2)}{(x-2)}\cdot\frac{7}{(x+2)}+\frac{(x+2)}{(x+2)}\cdot\frac{5}{(x-2)}=\frac{10x-2}{(x+2)(x-2)}$$

$$\frac{7x-14+5x+10}{(x-2)(x+2)}=\frac{10x-2}{(x+2)(x-2)}$$

$$\frac{12x-4-10x+2}{(x-2)(x+2)}=0$$

$$\frac{2x-2}{(x-2)(x+2)}=0 \Rightarrow 2x-2=0$$

$$\boxed{x=1}$$

10) A boat that travels 18 mi/hr in still water can travel 22 mi downstream in the same time as it takes to travel 14 mi upstream. Find the speed of the current in the river.

$d=rt$

	distance	rate	time $=\frac{d}{r}$
Down stream	22	$18+r$	$\frac{22}{18+r}$
Upstream	14	$18-r$	$\frac{14}{18-r}$

Let r = speed of the current

Same time $\Rightarrow$ $\frac{22}{18+r}=\frac{14}{18-r}$

$22(18-r)=14(18+r)$

$396-22r=252+14r$

$144=36r$

$4=r$

Speed of current is 4 mph

11) If the same number is added to both the numerator and denominator of the fraction $\frac{7}{9}$ and the result is $\frac{8}{9}$, find the number that was added to the numerator and denominator.

$\frac{7+x}{9+x} = \frac{8}{9}$ x = number added to top and bottom

$9(7+x) = 8(9+x)$

$63 + 9x = 72 + 8x$

$\boxed{x = 9}$

Check: $\frac{7+9}{9+9} = \frac{16}{18} = \frac{8}{9}$ ✓

12) A perfume is two be mixed in the ratio of 3 drops of pure essence to 7 drops of alcohol. How many drops of pure essence should be mixed with 56 drops of alcohol?

$\frac{3 \text{ pure essence}}{7 \text{ pure alcohol}}$ and $\frac{x \text{ pure essence}}{56 \text{ pure alcohol}}$

We need a proportion

$\Rightarrow \frac{3}{7} = \frac{x}{56}$

$3 \cdot 56 = 7x$

$168 = 7x$

$\boxed{x = 24 \text{ drops essence}}$

THIS PAGE IS LEFT BLANK FOR ANY SCRATCH WORK

END OF TEST