Math 100
American River College

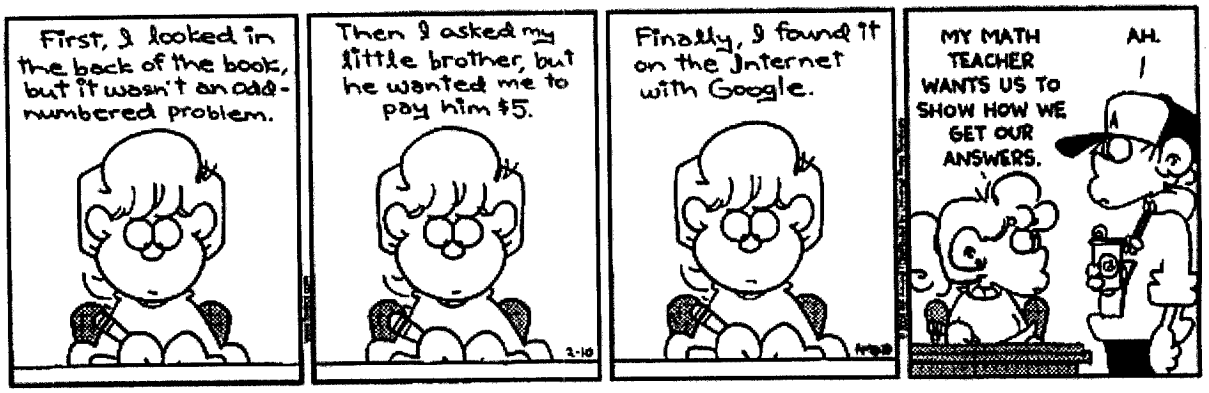
Name: Key

Student ID: _____

Exam 4

PLEASE READ ALL THE DIRECTIONS CAREFULLY

- Show all work. Solutions without proper work will receive no credit.
- Present work in a clear, organized manner.
- No notes, books, or calculators allowed.
- Write answers in **lowest terms** when appropriate
- Good Luck!



Problem	1	2	3	4	5	6	7	Bonus	Total
Score									
Possible	18	25	9	14	26	8	11	10	100

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1. (18 points) Divide the polynomials. Use long division when applicable.

a. (5 points) $\frac{8x^3y^2-9x^2y^3+5xy}{9xy^2}$

$= \frac{8x^3y^2}{9xy^2} - \frac{9x^2y^3}{9xy^2} + \frac{5xy}{9xy^2}$ Divide by a monomial

$= \boxed{\frac{8x^2}{9} - \frac{xy}{1} + \frac{5}{9y}}$

b. (6 points) $\frac{6x^2+x-6}{2x-1}$ ← long division

$$\begin{array}{r} 3x+2 \quad R-4 \\ 2x-1 \overline{)\,6x^2+x-6} \\ -(6x^2-3x) \\ \hline 4x-6 \\ -(4x-2) \\ \hline -4 \end{array}$$

Ans: $3x+2-\frac{4}{2x-1}$

c. (7 points) $\frac{8x^3+27}{x+4}$ long division

$$\begin{array}{r} 8x^2-32x+128 \quad R-485 \\ x+4 \overline{)\,8x^3+0x^2+0x+27} \\ -(8x^3+32x^2) \\ \hline -32x^2+0x \\ -(-32x^2-128x) \\ \hline 128x+27 \\ -(128x+512) \\ \hline -485 \end{array}$$

Ans: $8x^2-32x+128-\frac{485}{x+4}$

2. (25 points) Factor the expressions.

a. (5 points) $ad^2 + 10ad + 25a^2$

$= a(d^2 + 10d + 25a)$

not factorable

b. (5 points) $15x^4y^2 + 24x^6y^6 - 32x^7y^3$

$= x^4y^2(15 + 24x^2y^4 - 32x^3y)$

c. (7 points) $4p^4 + 36p^3 + 32p^2$

$= 4p^2(p^2 + 9p + 8)$

p: 8
s: 9

$= \boxed{4p^2(p+8)(p+1)}$

d. (8 points) $-2y^3 - 3y^2 - y$

p: 2 } 1, 2
s: 3 }

$= -y(2y^2 + 3y + 1)$

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

$= -y[2y(y+1) + 1(y+1)]$

$= \boxed{-y(y+1)(2y+1)}$

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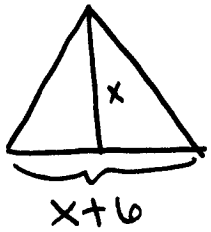
3. (9 points) The base of a triangle is 6 inches greater than the height. The area is 20 square inches.
   a. (3 points) Draw a diagram from the information provided.
   b. (2 points) State the equation for the problem.
   c. (4 points) Find the length of the triangle's base and height.



Area = 20 → $A = \frac{1}{2}b \cdot h$

$20 = \frac{1}{2}(x+6)x$

$40 = x^2 + 6x$

$0 = x^2 + 6x - 40$

p: -40 } 10, -4
s: 6 }

$0 = (x+10)(x-4)$

$x+10=0$ $\quad x-4=0$

$x = -10$ $\quad x = 4$

↳ choose positive length

Height: $x = 4$ inches
Base: $x+6 = 10$ inches

4. (14 points) Solve the equation for x

$$\frac{4}{x} - \frac{2}{x+1} = \frac{4}{3}$$

LCD: $x(x+1)(3) = 3x(x+1)$

Multiply by LCD

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

$4 \cdot 3(x+1) - 2 \cdot 3x = 4(x)(x+1)$

$12x + 12 - 6x = 4x^2 + 4x$

$6x + 12 = 4x^2 + 4x$

$-6x - 12 \quad -6x - 12$

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

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

$0 = 2x^2 - x - 6$

p: -12 } -4, 3
s: -1 }

$0 = 2x^2 - 4x + 3x - 6$

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

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

$x - 2 = 0$ $\quad 2x + 3 = 0$

$x = 2$ $\quad x = -3/2$

Check answers or state restrictions:

$x+1 \neq 1$

$x \neq 0$ $\quad x \neq -1$

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5. (26 points) Perform the indicated operation (multiply, divide, add, or subtract) for the rational expressions and write in lowest terms.

a. (5 points) $\frac{x^2-8x+15}{x^2-9x+4} \cdot \frac{7-x}{x^2+4x-21}$

$$\frac{(x-5)(x-3)\cdot(7-x)}{(x^2-9x+4)(x+7)(x-3)} = \frac{(x-5)(7-x)}{(x^2-9x+4)(x+7)}$$

1)
p: 18 { 9,2
s: 11 }
$3x^2+9x+2x+6$
$= 3x(x+3)+2(x+3)$
$= (3x+2)(x+3)$

2) p: 28 { 14,2
s: 14 }
$4x^2+2x+14x+7$
$2x(2x+1)+7(2x+1)$
$(2x+7)(2x+1)$

b. (8 points) $\frac{3x^2+11x+6}{4x^2+16x+7} \div \frac{9x^2+12x+4}{2x^2-x-28}$

3) p: 36 { 6,6
s: 12 }
$(3x+2)^2$

4) p: -56 { 7,-8
s: -1 }
$2x^2-8x+7-28$
$2x(x-4)+7(x-4)$
$(2x+7)(x-4)$

$$\frac{(3x+2)(x+3)}{(2x+7)(2x+1)} \cdot \frac{(2x+7)(x-4)}{(3x+2)(3x+2)} = \boxed{\frac{(x+3)(x-4)}{(2x+1)(3x+2)}}$$

c. (5 points) $\frac{2x+1}{x^2-x-6} - \frac{x-1}{x^2-x-6}$

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

d. (8 points) $\frac{2x}{x^2+x-12} + \frac{3x}{x^2-9}$

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

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

$$= \frac{2x^2+6x+3x^2+12x}{(x+4)(x^2-9)}$$

$$= \frac{5x^2+18x}{(x+4)(x^2-9)}$$

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6. (8 points) Simplify the complex fraction.

$$\frac{\frac{x^2-9}{x}}{x-3}$$

$$\frac{x^2-9}{x} \cdot \frac{1}{x-3} = \frac{(x-3)(x+3)}{(x)(x-3)}$$

$$= \boxed{\frac{x+3}{x}}$$

Bonus: Simplify the complex fraction.

$$\frac{\frac{1}{x}-\frac{1}{y}}{\frac{y}{x^2}-\frac{1}{y}}$$

LCD: $x^2 \cdot y$

$$\frac{\frac{x^2y}{x}-\frac{x^2y}{y}}{\frac{y \cdot x^2y}{x^2}-\frac{x^2y}{y}} = \frac{xy-x^2}{y^2-x^2} = \frac{x(y-x)}{(y+x)(y-x)} = \boxed{\frac{x}{y+x}}$$