Math 114
Midterm 2
Thu May 14, 2009

BEIGE

Name: _____

SCORE: _____ / 140 POINTS

- **ALL PROBLEMS MUST BE SOLVED ALGEBRAICALLY TO EARN CREDIT**
- **PUT A BOX AROUND EACH FINAL ANSWER**
- **SHOW COMPLETE AND PROPER WORK TO EARN FULL CREDIT**

Multiply and simplify: $\dfrac{x^2+2x-15}{x^2-7x+6}\cdot\dfrac{x^2-3x-18}{x^2-9}$

SCORE: ___ / 9 POINTS

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

$$= \boxed{\frac{x+5}{x-1}}$$

Subtract and simplify: $\dfrac{x+2}{x^2-4x+4}-\dfrac{x-1}{x^2-7x+10}$

$x^2-4x+4=(x-2)^2$

$x^2-7x+10=(x-2)(x-5)$

$LCD=(x-2)^2(x-5)$

SCORE: ___ / 12 POINTS

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

$$= \frac{(x^2-3x-10)-(x^2-3x+2)}{(x-2)^2(x-5)}$$

$$= \boxed{\frac{-12}{(x-2)^2(x-5)}}$$

Solve for x: $|8-3x|\le 2$

SCORE: ___ / 9 POINTS

$$-2\le 8-3x\le 2$$

$$-10\le -3x\le -6$$

$$\frac{10}{3}\ge x\ge 2$$

$$\boxed{2\le x\le \frac{10}{3}}$$

Write a proportion for, but **DO NOT SOLVE**:

SCORE: ___ / 4 POINTS

DY's car can travel 587 miles on 12 gallons of biofuel. How many gallons of biofuel will DY need to travel 869 miles ?

$$\boxed{\frac{587}{12}=\frac{869}{x}}$$

Add and simplify: $\dfrac{2}{x+4}+\dfrac{x-4}{x-2}$

SCORE: ___ / 9 POINTS

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

$$= \frac{2x-4+x^2-16}{(x+4)(x-2)}$$

$$= \boxed{\frac{x^2+2x-20}{(x+4)(x-2)}}$$

Fill in the blanks: The equation of the horizontal asymptote for $y=\dfrac{3-4x}{11x+5}$ is $y=\dfrac{-4}{11}$.

SCORE: ___ / 6 POINTS

The equation of the vertical asymptote for $y=\dfrac{3-4x}{11x+5}$ is $x=\dfrac{-5}{11}$.

$11x+5=0$

$x=\dfrac{-5}{11}$

Simplify: $\dfrac{\frac{5}{x-3}+\frac{2}{x}}{\frac{4}{x-3}-\frac{3}{x}} \cdot \dfrac{x(x-3)}{x(x-3)}$

SCORE: ___ / 9 POINTS

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

$$= \frac{5x+2x-6}{4x-3x+9} = \boxed{\frac{7x-6}{x+9}}$$

Solve for x: $|2x-5|+9=12$ **CHECK YOUR ANSWER(S)**

SCORE: ___ / 9 POINTS

$|2x-5|=3$

$2x-5=3$ OR $2x-5=-3$

$2x=8$ OR $2x=2$

$\boxed{x=4 \text{ OR } x=1}$

CHECK:

$x=4$ $|2(4)-5|+9$

$=|3|+9$

$=12$ ✓

$x=1$ $|2(1)-5|+9$

$=|-3|+9$

$=12$ ✓

Subtract and simplify: $\dfrac{2x^2-4x}{x^2-5x-6}-\dfrac{x^2-x+4}{x^2-5x-6}$

SCORE: ___ / 9 POINTS

$$= \frac{x^2-3x-4}{x^2-5x-6}$$

$$= \frac{(x-4)(x+1)}{(x-6)(x+1)}$$

$$= \boxed{\frac{x-4}{x-6}}$$

Simplify: $\dfrac{\dfrac{5}{x-2}-4}{3+\dfrac{7}{x-2}} \cdot \dfrac{x-2}{x-2}$

SCORE: ___ / 9 POINTS

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

$$= \frac{5-4x+8}{3x-6+7} = \boxed{\frac{-4x+13}{3x+1}}$$

Divide and simplify: $\dfrac{12x-8}{x^2-16} \div \dfrac{9x^2-4}{2x+8}$

SCORE: ___ / 9 POINTS

$$= \frac{12x-8}{x^2-16} \cdot \frac{2x+8}{9x^2-4}$$

$$= \frac{4(3x-2)}{(x+4)(x-4)} \cdot \frac{2(x+4)}{(3x+2)(3x-2)} = \boxed{\frac{8}{(x-4)(3x+2)}}$$

Simplify: $\dfrac{6x^2-x-12}{2x^2-11x+12}$

SCORE: ___ / 9 POINTS

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

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

$6(-12) = -72 = RS$

$-1 = R+S$

$-9, 8$

$6x^2-9x+8x-12$

$= 3x(2x-3)+4(2x-3)$

$= (3x+4)(2x-3)$

$2(12) = 24 = RS$

$-11 = R+S$

$-8, -3$

$2x^2-8x-3x+12$

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

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

Solve: A number divided by fifteen is equal to four divided by the sum of that number and four. Find the number. **CHECK YOUR ANSWER(S).** **SCORE: ___ / 9 POINTS**

$$\frac{x}{15} = \frac{4}{x+4}$$

$$x^2+4x = 60$$

$$x^2+4x-60 = 0$$

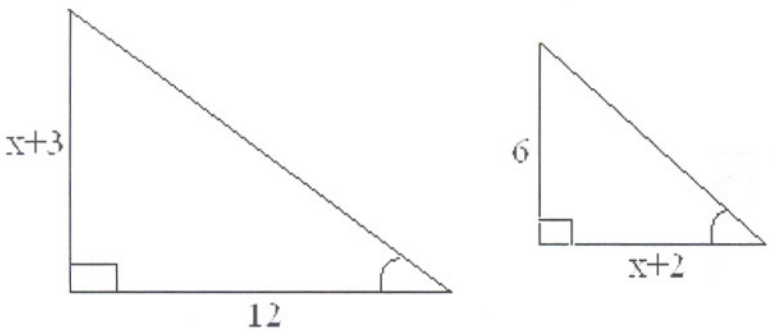
$$(x+10)(x-6) = 0$$

$\boxed{x=-10 \text{ OR } x=6}$

CHECK: $x=-10$ $\quad \frac{-10}{15} = -\frac{2}{3}$ $\quad \frac{4}{-10+4} = \frac{4}{-6} = -\frac{2}{3}$ ✓

$x=6$ $\quad \frac{6}{15} = \frac{2}{5}$ $\quad \frac{4}{6+4} = \frac{4}{10} = \frac{2}{5}$ ✓

Solve for x: **SCORE: ___ / 9 POINTS**



$$\frac{x+3}{12} = \frac{6}{x+2}$$

$$x^2+5x+6 = 72$$

$$x^2+5x-66 = 0$$

$$(x+11)(x-6) = 0$$

$x=-11$ OR $\boxed{x=6}$

Solve: The depth of an oil spill varies inversely as the square of the radius of the spill. If an oil spill of radius 30 meters has a depth of 12 millimeters, find the depth of the spill when its radius was 20 meters. **FOR FULL CREDIT, YOU MUST IDENTIFY WHAT ALL YOUR VARIABLES REPRESENT, FIND THE EQUATIONS CONNECTING THEM, AND SUMMARIZE YOUR FINAL ANSWER.** **SCORE: ___ / 10 POINTS**

D = DEPTH OF SPILL

R = RADIUS OF SPILL

$$D = \frac{k}{12^2}$$

$$12 = \frac{k}{30^2}$$

$$12 = \frac{k}{900} \Rightarrow k = 10800$$

$$D = \frac{10800}{12^2}$$

$$D = \frac{10800}{20^2}$$

$$= 27$$

THE SPILL HAS DEPTH 27mm WHEN ITS RADIUS WAS 20m

Solve for x: $3x^2\left(\frac{4}{x}-\frac{12}{x^2}\right)=\left(\frac{1}{3}\right)3x^2$ **CHECK YOUR ANSWER(S)** **SCORE: ___ / 9 POINTS**

$$12x-36 = x^2$$

$$0 = x^2-12x+36$$

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

$\boxed{x=6}$

CHECK: $\frac{4}{6} - \frac{12}{6^2}$

$= \frac{2}{3} - \frac{12}{36}$

$= \frac{2}{3} - \frac{1}{3}$

$= \frac{1}{3}$ ✓