Math 114 (8:30am – 9:20am)
Midterm 1 Version B
Wed Oct 19, 2011

NAME YOU ASKED TO BE CALLED: _____

SCORE: _____ / 140 POINTS

- **ALL PROBLEMS MUST BE SOLVED ALGEBRAICALLY TO EARN CREDIT (NO GUESS & CHECK)**
- **PUT A BOX AROUND EACH FINAL ANSWER**
- **SHOW COMPLETE AND PROPER WORK TO EARN FULL CREDIT**

Find the equation of the horizontal asymptote of $y = \dfrac{5+13x}{17x-12}$.

SCORE: ___ / 8 POINTS

$y \approx \dfrac{13x}{17x}$ for large values of x

$\boxed{y = \dfrac{13}{17}}$

Find the equation of the vertical asymptote of $y = \dfrac{5+13x}{17x-12}$.

$17x - 12 = 0$

$\boxed{x = \dfrac{12}{17}}$

Simplify: $\dfrac{3x^2+5x-2}{6x^2+5x-14}$ **SPECIFY ANY RESTRICTIONS**.

SCORE: ___ / 15 POINTS

$= \dfrac{(3x-1)(x+2)}{(6x-7)(x+2)}$

$= \boxed{\dfrac{3x-1}{6x-7}}$ $\quad x+2 \neq 0$

$x \neq -2$

Solve: A number divided by two is equal to twelve divided by five less than that number. Find the number. **CHECK YOUR ANSWER(S).**

SCORE: ___ / 15 POINTS

$\dfrac{x}{2} = \dfrac{12}{x-5}$

$x^2 - 5x = 24$

$x^2 - 5x - 24 = 0$

$(x-8)(x+3) = 0$

$\boxed{x = 8 \text{ or } x = -3}$

CHECK:

$x = 8$	$x = -3$
$\dfrac{8}{2} = 4$	$\dfrac{-3}{2} = -\dfrac{3}{2}$
$\dfrac{12}{3} = 4$	$\dfrac{12}{-8} = -\dfrac{3}{2}$

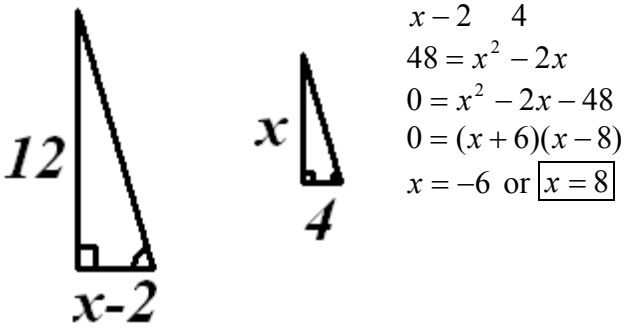
Subtract and simplify: $\dfrac{7x^2-7x-4}{x^2-x-2}-\dfrac{5x^2-6x+2}{x^2-x-2}$

SCORE: ___ / 15 POINTS

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

Solve for x in the following similar triangles:

SCORE: ___ / 12 POINTS



$$\frac{12}{x-2}=\frac{x}{4}$$
$$48=x^2-2x$$
$$0=x^2-2x-48$$
$$0=(x+6)(x-8)$$
$$x=-6 \text{ or } \boxed{x=8}$$

Divide and simplify: $\dfrac{50x^2-8}{36x^2-27x^3}\div\dfrac{20x+8}{9x^2-12x}$

SCORE: ___ / 15 POINTS

$$=\frac{2(25x^2-4)}{-9x^2(3x-4)}\div\frac{4(5x+2)}{3x(3x-4)}$$
$$=\frac{2(5x+2)(5x-2)}{-9x^2(3x-4)}\times\frac{3x(3x-4)}{4(5x+2)}$$
$$=\frac{5x-2}{-3x}\times\frac{1}{2}$$
$$=\frac{5x-2}{-6x}$$
$$=\boxed{-\frac{5x-2}{6x} \text{ or } \frac{2-5x}{6x}}$$

Simplify: $\dfrac{1-\dfrac{2}{x-4}}{\dfrac{2}{x-4}-\dfrac{9}{x+3}}$ **SCORE: ___ / 15 POINTS**

$$
\begin{aligned}
&= \frac{1-\dfrac{2}{x-4}}{\dfrac{2}{x-4}-\dfrac{9}{x+3}} \cdot \frac{(x-4)(x+3)}{(x-4)(x+3)} \\
&= \frac{(x-4)(x+3)-2(x+3)}{2(x+3)-9(x-4)} \\
&= \frac{x^2-x-12-2x-6}{2x+6-9x+36} \\
&= \frac{x^2-3x-18}{-7x+42} \\
&= \frac{(x-6)(x+3)}{-7(x-6)} \\
&= \frac{x+3}{-7} \\
&= \boxed{-\frac{x+3}{7}}
\end{aligned}
$$

Solve for x: $\dfrac{2}{x^2-4x+3}-\dfrac{1}{x^2-1}=\dfrac{1}{x-3}$ **CHECK YOUR ANSWER(S)** **SCORE: ___ / 15 POINTS**

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

$$
\begin{aligned}
&2(x+1)-(x-3)=(x-1)(x+1) \\
&2x+2-x+3=x^2-1 \\
&x+5=x^2-1 \\
&0=x^2-x-6 \\
&0=(x+2)(x-3)
\end{aligned}
$$

$\boxed{x=-2}$ or $x=3$

CHECK:

$x=-2$

$\dfrac{2}{15}-\dfrac{1}{3}=\dfrac{2}{15}-\dfrac{5}{15}=-\dfrac{3}{15}=-\dfrac{1}{5}$

$\dfrac{1}{-5}=-\dfrac{1}{5}$

$x=3$

$\dfrac{2}{0}$ IS UNDEFINED

Subtract and simplify: $\dfrac{x+3}{x^2-1}-\dfrac{x+5}{x^2-2x-3}$ **SCORE: ___ / 15 POINTS**

$$=\frac{x+3}{(x-1)(x+1)}-\frac{x+5}{(x-3)(x+1)}$$
$$=\frac{x+3}{(x-1)(x+1)}\frac{x-3}{x-3}-\frac{x+5}{(x-3)(x+1)}\frac{x-1}{x-1}$$
$$=\frac{x^2-9-(x^2+4x-5)}{(x-1)(x+1)(x-3)}$$
$$=\frac{-4x-4}{(x-1)(x+1)(x-3)}$$
$$=\frac{-4(x+1)}{(x-1)(x+1)(x-3)}$$
$$=\boxed{\frac{-4}{(x-1)(x-3)}}$$

Solve: The cost of paper needed to wrap a cylinder varies directly as the weight of the cylinder and inversely as the radius. A cylinder weighing 21 ounces with a radius of 4 inches requires 35 cents of paper to wrap. Find the cost of paper needed to wrap a cylinder with a radius of 2 inches that weighs 12 ounces. **SCORE: ___ / 15 POINTS**

FOR FULL CREDIT, YOU MUST IDENTIFY WHAT ALL YOUR VARIABLES REPRESENT, FIND THE SPECIFIC EQUATION CONNECTING THEM, AND SUMMARIZE YOUR FINAL ANSWER IN A SENTENCE USING THE CORRECT UNITS OF MEASUREMENT.

C = cost of paper (cents)
w = weight of cylinder (ounces)
r = radius (inches)

$$C=\frac{kw}{r} \qquad C=\frac{20w}{3r}$$
$$35=\frac{k(21)}{4} \qquad C=\frac{20(12)}{3(2)}$$
$$140=21k \qquad C=40$$
$$\frac{20}{3}=k$$

It costs 40 cents to wrap the cylinder.