Math 114 (7:30am – 8:20am) **NAME YOU ASKED TO BE CALLED: _____**
Midterm 1 Version N
Wed Oct 19, 2011

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 $y = \dfrac{5+12x}{17x-13}$. **SCORE: ___ / 8 POINTS**

$y \approx \dfrac{12x}{17x}$ for large values of x

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

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

$17x - 13 = 0$

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

Simplify: $\dfrac{3x^2+5x-2}{6x^2+7x-10}$ **SPECIFY ANY RESTRICTIONS**. **SCORE: ___ / 15 POINTS**

$= \dfrac{(3x-1)(x+2)}{(6x-5)(x+2)}$

$= \boxed{\dfrac{3x-1}{6x-5}}$ $\quad x+2 \neq 0$

$\quad x \neq -2$

Solve: A number divided by three is equal to twelve divided by five less than that number. Find the number. **CHECK YOUR ANSWER(S).** **SCORE: ___ / 15 POINTS**

$\dfrac{x}{3} = \dfrac{12}{x-5}$

$x^2 - 5x = 36$

$x^2 - 5x - 36 = 0$

$(x-9)(x+4) = 0$

$\boxed{x = 9 \text{ or } x = -4}$

CHECK: $x = 9$ $\dfrac{9}{3} = 3$ $\dfrac{12}{4} = 3$

$x = -4$ $\dfrac{-4}{3} = -\dfrac{4}{3}$ $\dfrac{12}{-9} = -\dfrac{4}{3}$

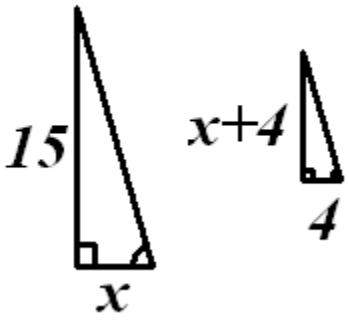
Subtract and simplify: $\dfrac{7x^2-11x-5}{x^2-x-12}-\dfrac{5x^2-6x+7}{x^2-x-12}$

SCORE: ___ / 15 POINTS

$$=\frac{2x^2-5x-12}{x^2-x-12}$$
$$=\frac{(x-4)(2x+3)}{(x-4)(x+3)}$$
$$=\boxed{\frac{2x+3}{x+3}}$$

Solve for x in the following similar triangles:

SCORE: ___ / 12 POINTS



$$\frac{15}{x}=\frac{x+4}{4}$$
$$60=x^2+4x$$
$$0=x^2+4x-60$$
$$0=(x+10)(x-6)$$
$$x=-10 \text{ or } \boxed{x=6}$$

Divide and simplify: $\dfrac{12x^2-75}{20x^2-30x^3}\div\dfrac{12x-30}{15x^2-10x}$

SCORE: ___ / 15 POINTS

$$=\frac{3(4x^2-25)}{-10x^2(3x-2)}\div\frac{6(2x-5)}{5x(3x-2)}$$
$$=\frac{3(2x+5)(2x-5)}{-10x^2(3x-2)}\times\frac{5x(3x-2)}{6(2x-5)}$$
$$=\frac{2x+5}{-2x}\times\frac{1}{2}$$
$$=\frac{2x+5}{-4x}$$
$$=\boxed{-\frac{2x+5}{4x}}$$

Simplify: $\dfrac{1-\dfrac{6}{x-5}}{\dfrac{2}{x-5}-\dfrac{3}{x-2}}$ **SCORE: ___ / 15 POINTS**

$$
\begin{aligned}
&= \frac{1-\dfrac{6}{x-5}}{\dfrac{2}{x-5}-\dfrac{3}{x-2}} \cdot \frac{(x-5)(x-2)}{(x-5)(x-2)} \\
&= \frac{(x-5)(x-2)-6(x-2)}{2(x-2)-3(x-5)} \\
&= \frac{x^2-7x+10-6x+12}{2x-4-3x+15} \\
&= \frac{x^2-13x+22}{-x+11} \\
&= \frac{(x-11)(x-2)}{-(x-11)} \\
&= \boxed{-(x-2) \text{ or } 2-x}
\end{aligned}
$$

Solve for x: $\dfrac{5}{x^2+x-6}-\dfrac{4}{x^2-4}=\dfrac{1}{x+3}$ **CHECK YOUR ANSWER(S)** **SCORE: ___ / 15 POINTS**

$$(x-2)(x+3)(x+2)\left[\frac{5}{(x-2)(x+3)}-\frac{4}{(x-2)(x+2)}\right]=\frac{1}{x+3}(x-2)(x+3)(x+2)$$

$$5(x+2)-4(x+3)=(x-2)(x+2)$$

$$5x+10-4x-12=x^2-4$$

$$x-2=x^2-4$$

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

$$0=(x+1)(x-2)$$

$\boxed{x=-1}$ or $x=2$

CHECK:

$x=-1$

$$\frac{5}{-6}-\frac{4}{-3}=-\frac{5}{6}+\frac{8}{6}=\frac{3}{6}=\frac{1}{2}$$

$\dfrac{1}{2}$

$x=2$

$\dfrac{5}{0}$ IS UNDEFINED

Subtract and simplify: $\dfrac{x+7}{x^2-4x+3}-\dfrac{x+3}{x^2-3x+2}$ **SCORE: ___ / 15 POINTS**

$$=\frac{x+7}{(x-1)(x-3)}-\frac{x+3}{(x-1)(x-2)}$$
$$=\frac{x+7}{(x-1)(x-3)}\frac{x-2}{x-2}-\frac{x+3}{(x-1)(x-2)}\frac{x-3}{x-3}$$
$$=\frac{x^2+5x-14-(x^2-9)}{(x-1)(x-2)(x-3)}$$
$$=\frac{5x-5}{(x-1)(x-2)(x-3)}$$
$$=\frac{5(x-1)}{(x-1)(x-2)(x-3)}$$
$$=\boxed{\frac{5}{(x-2)(x-3)}}$$

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 8 ounces with a radius of 3 inches requires 12 cents of paper to wrap. Find the cost of paper needed to wrap a cylinder with a radius of 1.5 inches that weighs 11 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)

$$C=\frac{kw}{r} \qquad C=\frac{9w}{2r}$$
$$12=\frac{k(8)}{3} \qquad C=\frac{9(11)}{2(1.5)}$$
$$36=8k \qquad C=33$$
$$\frac{9}{2}=k$$

It costs 33 cents to wrap the cylinder.