Math 114
Midterm 2
Thu May 14, 2009

WHITE

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**

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 ?

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

Fill in the blanks: The equation of the horizontal asymptote for $y = \frac{3-4x}{11x+5}$ is $y = -\frac{4}{11}$. **SCORE: ___ / 6 POINTS**

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

$11x+5=0$

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

Solve: The depth of an oil spill varies inversely as the square of the radius of the spill. **SCORE: ___ / 10 POINTS**

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.

D = DEPTH OF OIL SPILL

R = RADIUS

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

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

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

$k = 10800$

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

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

$D = 27$

THE DEPTH OF THE OIL SPILL IS 27 mm WHEN THE RADIUS IS 20 m

Solve: A number divided by fifteen is equal to four divided by the sum of that number and four. **SCORE: ___ / 9 POINTS**

Find the number. **CHECK YOUR ANSWER(S).**

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

$x^2+4x=60$

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

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

$x=-10$ or 6

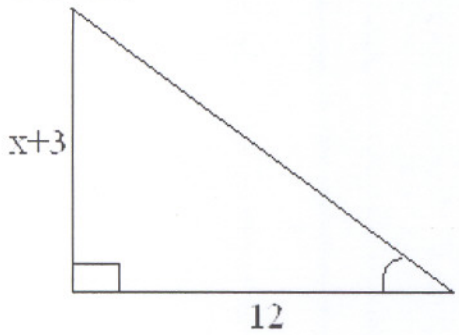
CHECK: $x=-10$ $\frac{-10}{15} = -\frac{2}{3}$

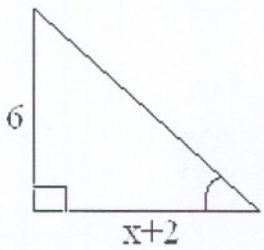
$\frac{4}{-10+6} = \frac{4}{-6} = -\frac{2}{3}$ ✓

$x=6$ $\frac{6}{15} = \frac{2}{5}$

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

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 for x: $|8-3x| \le 2$ **SCORE: ___ / 9 POINTS**

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

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

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

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

Subtract and simplify: $\dfrac{x+2}{x^2-4x+4} - \dfrac{x-1}{x^2-7x+10}$ **SCORE: ___ / 12 POINTS**

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

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

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

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

$$= \frac{(x^2-3x-10)-(x^2-3x+2)}{(x-2)^2(x-5)} = \boxed{\frac{-12}{(x-2)^2(x-5)}}$$

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

$$\frac{4x-12}{x^2} = \frac{1}{3}$$

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

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

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

$$\boxed{x = 6}$$

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

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

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

$= \dfrac{1}{3}$

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:

$x=4$ $|2(4)-5|+9=|3|+9$
$=12$ ✓

$x=1$ $|2(1)-5|+9=|-3|+9$
$=12$ ✓

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

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

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

Simplify: $\dfrac{6x^2-x-12}{2x^2-11x+12}$ **SCORE: ___ / 9 POINTS**

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

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

$6(-12)=-72=RS$ $2(12)=24=RS$

$-1=R+S$ $-11=R+S$

$-9, 8$ $-8, -3$

$6x^2-9x+8x-12$ $2x^2-8x-3x+12$

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

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

Add and simplify: $\dfrac{2}{x+4}+\dfrac{x-4}{x-2}$ **SCORE: ___ / 9 POINTS**

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

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

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

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

SCORE: ___ / 9 POINTS

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

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

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

SCORE: ___ / 9 POINTS

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

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

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

SCORE: ___ / 9 POINTS

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

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

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

SCORE: ___ / 9 POINTS

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

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