Solve: The height of a cake varies directly as the amount of batter available and inversely as the base area of its baking pan. Baking 2 cups of batter in a 24 square inch pan results in a 3 inch tall cake. How much batter is needed for a 3 inch tall cake in a 32 square inch pan ? **SCORE: _____ / 15 PTS**

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.

h = HEIGHT OF CAKE

b = AMOUNT OF BATTER

a = AREA OF PAN

$h = \frac{kb}{a}$ $\qquad$ $h = \frac{36b}{a}$

$3 = \frac{k(2)}{24}$ $\qquad$ $3 = \frac{36b}{32}$

$k = 36$ $\qquad$ $b = 2\frac{2}{3}$

$2\frac{2}{3}$ CUPS OF BATTER ARE NEEDED

Subtract and simplify: $\dfrac{x+8}{x^2+6x+8} - \dfrac{x+6}{x^2+7x+12}$

$x^2+6x+8 = (x+2)(x+4)$

$x^2+7x+12 = (x+3)(x+4)$

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

SCORE: ____ / 15 PTS

$$= \frac{x+8}{(x+2)(x+4)} \cdot \frac{x+3}{x+3} - \frac{x+6}{(x+3)(x+4)} \cdot \frac{x+2}{x+2}$$

$$= \frac{x^2+11x+24-(x^2+8x+12)}{(x+2)(x+3)(x+4)}$$

$$= \frac{3x+12}{(x+2)(x+3)(x+4)} = \frac{3(x+4)}{(x+2)(x+3)(x+4)} = \frac{3}{(x+2)(x+3)}$$

Solve for x: $\dfrac{5}{x^2+x-6}+\dfrac{1}{x^2+6x+9}=\dfrac{1}{x-2}$ **CHECK YOUR ANSWER(S).** **SCORE: ____ / 15 PTS**

$x^2+x-6=(x+3)(x-2)$

$x^2+6x+9=(x+3)^2$

$x-2=\quad\quad(x-2)$

$LCD=(x+3)^2(x-2)$

$$(x+3)^2(x-2)\left(\frac{5}{(x+3)(x-2)}+\frac{1}{(x+3)^2}\right)$$

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

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

$$5x+15+x-2=x^2+6x+9$$

$$4=x^2$$

$$x=\pm 2$$

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

CHECK:

$x=2$ $\frac{5}{0}+\cdots$ FAILS

$x=-2$ $\frac{5}{-4}+\frac{1}{1}\stackrel{?}{=}\frac{1}{-4}$

$=-\frac{5}{4}+1=-\frac{1}{4}$ ✓

Solve: Pat & Chris & Hunter each took a 35 km hike. **SCORE: _____ / 18 PTS**

[a] Hunter was hiking at 4 km per hour. How many hours did Hunter hike ?

$\frac{35}{4} = 8.75$ HOURS

[b] Pat was hiking 1 km per hour faster than Chris, and took 4 hours less time than Chris.
How fast was Pat hiking ?
FOR FULL CREDIT, YOU MUST WRITE AND SOLVE A RATIONAL EQUATION, AND SUMMARIZE YOUR FINAL ANSWER IN A SENTENCE USING THE CORRECT UNITS OF MEASUREMENT.

LET x = PAT'S SPEED

SO $x-1$ = CHRIS' SPEED

$\frac{35}{x}$ = PAT'S TIME

$\frac{35}{x-1}$ = CHRIS' TIME

$$\frac{35}{x} = \frac{35}{x-1} - 4$$

$$x(x-1)\left(\frac{35}{x}\right) = \left(\frac{35}{x-1} - 4\right)x(x-1)$$

$$35(x-1) = 35x - 4x(x-1)$$

$$35x - 35 = 35x - 4x^2 + 4x$$

$$4x^2 - 4x - 35 = 0$$

$$(2x-7)(2x+5) = 0$$

$$x = \frac{7}{2}, -\frac{5}{2}$$

PAT WAS HIKING 3.5 km PER HOUR

Subtract and simplify: $\dfrac{7x^2-9x-8}{x^2-3x-10}-\dfrac{5x^2-2x+7}{x^2-3x-10}$

SCORE: _____ / 15 PTS

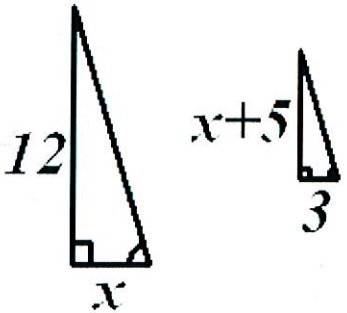
$$= \frac{2x^2-7x-15}{x^2-3x-10}$$

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

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

Solve for x in the following similar triangles:

SCORE: _____ / 12 PTS



$$\frac{x}{3} = \frac{12}{x+5}$$

$$x^2 + 5x = 36$$

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

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

$$x = -9, 4$$

Simplify: $\dfrac{6x^2 - 11x + 3}{9x^2 + 3x - 2}$

SCORE: _____ / 12 PTS

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

$= \dfrac{2x-3}{3x+2}$

Find the equation of the horizontal asymptote of $y = \dfrac{4-9x}{18x-12}$. Simplify your answer.

SCORE: _____ / 8 PTS

As $x \to \pm\infty$, $y \approx \dfrac{-9x}{18x}$

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

Find the equation of the vertical asymptote of $y = \dfrac{4-9x}{18x-12}$. Simplify your answer.

$18x - 12 = 0$

$x = \dfrac{2}{3}$

Divide and simplify: $\dfrac{27x^2-48}{20x^2-30x^3} \div \dfrac{18x-24}{15x^2-10x}$

SCORE: _____ / 15 PTS

$$= \frac{3(9x^2-16)}{-10x^2(3x-2)} \cdot \frac{5x(3x-2)}{6(3x-4)}$$

$$= \frac{3(3x-4)(3x+4)}{-10x^2(3x-2)} \cdot \frac{5x(3x-2)}{6(3x-4)}$$

$-10 \div -2 = 5$, $6 \div 2 = 3$

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

Simplify: $\dfrac{1-\dfrac{2}{x-8}}{\dfrac{2}{x-8}-\dfrac{8}{x-2}} \cdot \dfrac{(x-8)(x-2)}{(x-8)(x-2)}$

SCORE: ____ / 15 PTS

$= \dfrac{(x-8)(x-2)-2(x-2)}{2(x-2)-8(x-8)}$

$= \dfrac{(x-2)(x-8-2)}{2x-4-8x+64}$

$= \dfrac{(x-2)(x-10)}{-6x+60}$

$= \dfrac{(x-2)(x-10)}{-6(x-10)}$

$= -\dfrac{x-2}{6}$ OR $\dfrac{2-x}{6}$