Solve: The height of a cake varies directly as the amount of batter available and inversely as the base   SCORE: _____ / 15 PTS
area of its baking pan. Baking 3 cups of batter in a 48 square inch pan results in a 2 inch tall cake. How much batter is
needed for a 4 inch tall cake in a 36 square inch pan ?
**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

$$h = \frac{kb}{a}$$

$$2 = \frac{k(3)}{48}$$

$$k = 32$$

$$h = \frac{32b}{a}$$

$$4 = \frac{32b}{36}$$

$$b = 4.5$$

4.5 CUPS OF BATTER
ARE NEEDED

Subtract and simplify: $\dfrac{x+5}{x^2+7x+12} - \dfrac{x+6}{x^2+6x+8}$

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

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

SCORE: _____ / 15 PTS

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

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

$$= \frac{x^2+7x+10-(x^2+9x+18)}{(x+2)(x+3)(x+4)}$$

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

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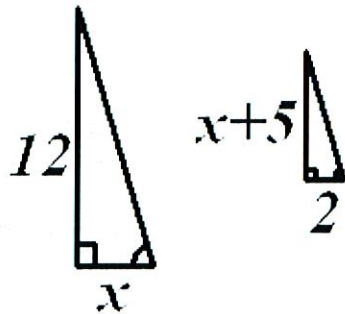$$\frac{5x^2 - 8x - 9}{x^2 - 2x - 8} - \frac{3x^2 - 5x + 5}{x^2 - 2x - 8}$$

$$= \frac{2x^2 - 3x - 14}{x^2 - 2x - 8}$$

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

$$= \frac{2x-7}{x-4}$$

Solve for x in the following similar triangles:

$$\frac{x}{2} = \frac{12}{x+5}$$

$$x^2 + 5x = 24$$

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

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

$$x = \cancel{-8}, 3$$

Simplify: $\dfrac{6x^2 - 7x + 2}{4x^2 + 4x - 3}$

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

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

Find the equation of the horizontal asymptote of $y = \dfrac{5-9x}{15x-10}$. Simplify your answer.

AS $x \to \pm\infty$, $y \approx \dfrac{-9x}{15x}$

$y = -\dfrac{3}{5}$

Find the equation of the vertical asymptote of $y = \dfrac{5-9x}{15x-10}$. Simplify your answer.

$15x - 10 = 0$

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

Divide and simplify: $\dfrac{32x^2 - 18}{45x^2 - 30x^3} \div \dfrac{24x - 18}{10x^2 - 15x}$

$$= \dfrac{2(16x^2 - 9)}{-15x^2(2x-3)} \cdot \dfrac{5x(2x-3)}{6(4x-3)}$$

$$= \dfrac{2(4x-3)(4x+3)}{-15x^2(2x-3)} \cdot \dfrac{5x(2x-3)}{6(4x-3)}$$

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

Simplify:

$$\dfrac{1 - \dfrac{8}{x-6}}{\dfrac{4}{x-6} - \dfrac{6}{x-2}} \cdot \dfrac{(x-6)(x-2)}{(x-6)(x-2)}$$

SCORE: _____ / 15 PTS

$$= \dfrac{(x-6)(x-2) - 8(x-2)}{4(x-2) - 6(x-6)}$$

$$= \dfrac{(x-2)(x-6-8)}{4x - 8 - 6x + 36}$$

$$= \dfrac{(x-2)(x-14)}{-2x + 28}$$

$$= \dfrac{(x-2)(x-14)}{-2(x-14)}$$

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

Solve for x: $\dfrac{5}{x^2+3x-4}+\dfrac{3}{x^2+8x+16}=\dfrac{1}{x-1}$ **<u>CHECK YOUR ANSWER(S).</u>**   SCORE: ____ / 15 PTS

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

$$\left(\frac{1}{x-1}\right)(x+4)^2(x-1)$$

$$5(x+4)+3(x-1)=(x+4)^2$$
$$\cancel{5x}+20+\cancel{3x}-3=x^2+\cancel{8x}+16$$
$$1=x^2$$
$$x=\pm1$$

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

$$x^2+3x-4=(x+4)(x-1)$$
$$x^2+8x+16=(x+4)^2$$
$$x-1=\qquad(x-1)$$
$$LCD=(x+4)^2(x-1)$$

CHECK:
$x=1$ $\dfrac{5}{0}+\cdots$ FAILS

$x=-1$ $\dfrac{5}{-6}+\dfrac{3}{9}\overset{?}{=}\dfrac{1}{-2}$

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

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

Solve: Pat & Chris & Hunter each took a 63 km hike.   **SCORE:** _____ / 18 PTS

[a]   Hunter was hiking at 6 km per hour. How many hours did Hunter hike ?

$$\frac{63}{6} = 10.5 \text{ HOURS}$$

[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

$\frac{63}{x}$ = PAT'S TIME

$\frac{63}{x-1}$ = CHRIS' TIME

$\frac{63}{x} = \frac{63}{x-1} - 4$

$x(x-1)\left(\frac{63}{x}\right) = \left(\frac{63}{x-1} - 4\right) \times (x-1)$

$63(x-1) = 63x - 4x(x-1)$

$63x - 63 = 63x - 4x^2 + 4x$

$4x^2 - 4x - 63 = 0$

$(2x - 9)(2x + 7) = 0$

$x = \frac{9}{2}, -\frac{7}{2}$

PAT WAS HIKING
4.5 km PER HOUR