

Solutions for In-Class Problems 1 for Monday, January 22

These problems are from **Pre-Class Problems 1**.

You can go to the solution for each problem by clicking on the problem letter or problem number.

1. Solve the equation  $\frac{2}{3}x - 7 = \frac{1}{4}x + \frac{5}{2}$ .

2. Solve the following equations.

a.  $\frac{3}{4y} - \frac{5}{8} = \frac{1}{2y} - \frac{7}{6}$

b.  $\frac{4}{t-4} - \frac{5}{6} = \frac{t}{t-4}$

c.  $\frac{3}{x+3} = \frac{11}{x^2-9}$

d.  $\frac{5}{2w-3} - \frac{6}{w+6} = \frac{4w+92}{2w^2+9w-18}$

e.  $\frac{3}{2x-5} = \frac{2}{3-7x}$

3. Solve for the indicated variable.

a.  $A = \frac{1}{2}h(b_1 + b_2)$  for  $b_1$

b.  $y = mx + b$  for  $x$

4. Write each expression in terms of  $i$  and simplify.

a.  $\sqrt{-5} \sqrt{-15}$

b.  $\frac{\sqrt{-96}}{\sqrt{6}}$

5. Determine the real part and the imaginary part of  $\frac{7}{3} - 9i$ .

## SOLUTIONS:

$$1. \quad \frac{2}{3}x - 7 = \frac{1}{4}x + \frac{5}{2}$$

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$$\text{LCD}(3, 4, 2) = 12$$

$$12 \left( \frac{2}{3}x - 7 \right) = \left( \frac{1}{4}x + \frac{5}{2} \right) 12 \Rightarrow 8x - 84 = 3x + 30 \Rightarrow 5x = 114$$

$$x = \frac{114}{5}$$

$$\text{NOTE: } 12 \left( \frac{2}{3}x - 7 \right) = 12 \left( \frac{2}{3}x \right) - 12(7) = 4 \cdot 2x - 84 = 8x - 84$$

$$\left( \frac{1}{4}x + \frac{5}{2} \right) 12 = 12 \left( \frac{1}{4}x \right) + 12 \left( \frac{5}{2} \right) = 3 \cdot 1x + 6 \cdot 5 = 3x + 30$$

$$\text{Answer: } x = \frac{114}{5} \quad \text{or} \quad \left\{ \frac{114}{5} \right\}$$

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$$2a. \quad \frac{3}{4y} - \frac{5}{8} = \frac{1}{2y} - \frac{7}{6}$$

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$$\text{NOTE: } y \neq 0$$

$$\text{LCD}(4y, 8, 2y, 6) = 24y$$

$$24y \left( \frac{3}{4y} - \frac{5}{8} \right) = \left( \frac{1}{2y} - \frac{7}{6} \right) 24y \Rightarrow 18 - 15y = 12 - 28y \Rightarrow$$

$$13y = -6 \Rightarrow y = -\frac{6}{13}$$

NOTE:  $24y \left( \frac{3}{4y} - \frac{5}{8} \right) = 24y \left( \frac{3}{4y} \right) - 24y \left( \frac{5}{8} \right) = 6 \cdot 3 - 3y \cdot 5 =$   
 $18 - 15y$

$$\left( \frac{1}{2y} - \frac{7}{6} \right) 24y = 24y \left( \frac{1}{2y} \right) - 24y \left( \frac{7}{6} \right) = 12 \cdot 1 - 4y \cdot 7 = 12 - 28y$$

**Answer:**  $y = -\frac{6}{13}$  or  $\left\{ -\frac{6}{13} \right\}$

Back to [Problem 2](#).

2b.  $\frac{4}{t-4} - \frac{5}{6} = \frac{t}{t-4}$

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NOTE:  $t \neq 4$

$$\text{LCD}(t-4, 6) = 6(t-4)$$

$$6(t-4) \left( \frac{4}{t-4} - \frac{5}{6} \right) = \left( \frac{t}{t-4} \right) 6(t-4) \Rightarrow$$

$$24 - 5(t-4) = 6t \Rightarrow 24 - 5t + 20 = 6t \Rightarrow 44 - 5t = 6t \Rightarrow$$

$$44 = 11t \Rightarrow t = 4$$

If  $t = 4$ , then  $t - 4 = 0$ . Thus, you would have division by zero in the fractions  $\frac{4}{t - 4}$  and  $\frac{t}{t - 4}$ . Division by zero is undefined.

NOTE:  $6(t - 4) \left( \frac{4}{t - 4} - \frac{5}{6} \right) = 6(t - 4) \left( \frac{4}{t - 4} \right) - 6(t - 4) \left( \frac{5}{6} \right) =$   
 $6 \cdot 4 - (t - 4)5$  and  $6(t - 4) \left( \frac{t}{t - 4} \right) = 6 \cdot t$ .

**Answer:** No solution

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2c.  $\frac{3}{x + 3} = \frac{11}{x^2 - 9}$

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NOTE:  $x^2 - 9 = (x + 3)(x - 3)$

$$\frac{3}{x + 3} = \frac{11}{x^2 - 9} \Rightarrow \frac{3}{x + 3} = \frac{11}{(x + 3)(x - 3)}$$

NOTE:  $x \neq -3, x \neq 3$

LCD[ $x + 3, (x + 3)(x - 3)$ ] =  $(x + 3)(x - 3)$

$$\frac{3}{x + 3} = \frac{11}{(x + 3)(x - 3)} \Rightarrow$$

$$(x + 3)(x - 3) \left( \frac{3}{x + 3} \right) = \left( \frac{11}{(x + 3)(x - 3)} \right) (x + 3)(x - 3) \Rightarrow$$

$$3(x - 3) = 11 \Rightarrow 3x - 9 = 11 \Rightarrow 3x = 20 \Rightarrow x = \frac{20}{3}$$

NOTE:  $(x + 3)(x - 3) \left( \frac{3}{x + 3} \right) = (x - 3)3$  and

$$(x + 3)(x - 3) \left( \frac{11}{(x + 3)(x - 3)} \right) = 1 \cdot 11 = 11$$

**Answer:**  $x = \frac{20}{3}$  or  $\left\{ \frac{20}{3} \right\}$

Back to [Problem 2](#).

2d.  $\frac{5}{2w - 3} - \frac{6}{w + 6} = \frac{4w + 92}{2w^2 + 9w - 18}$

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NOTE:  $2w^2 + 9w - 18 = (w + 6)(2w - 3)$

$$\frac{5}{2w - 3} - \frac{6}{w + 6} = \frac{4w + 92}{2w^2 + 9w - 18} \Rightarrow$$

$$\frac{5}{2w - 3} - \frac{6}{w + 6} = \frac{4w + 92}{(w + 6)(2w - 3)}$$

NOTE:  $w \neq \frac{3}{2}$ ,  $w \neq -6$

$$\text{LCD}[2w - 3, w + 6, (w + 6)(2w - 3)] = (w + 6)(2w - 3)$$

$$\frac{5}{2w - 3} - \frac{6}{w + 6} = \frac{4w + 92}{(w + 6)(2w - 3)} \Rightarrow$$

$$(w + 6)(2w - 3) \left( \frac{5}{2w - 3} - \frac{6}{w + 6} \right) = \left[ \frac{4w + 92}{(w + 6)(2w - 3)} \right] (w + 6)(2w - 3)$$

$$\Rightarrow 5(w + 6) - 6(2w - 3) = 4w + 92 \Rightarrow 5w + 30 - 12w + 18 = 4w + 92$$

$$\Rightarrow -7w + 48 = 4w + 92 \Rightarrow -44 = 11w \Rightarrow w = -4$$

NOTE:  $(w + 6)(2w - 3) \left( \frac{5}{2w - 3} \right) = (w + 6)5$  and

$$(w + 6)(2w - 3) \left( \frac{6}{w + 6} \right) = (2w - 3)6 \text{ and}$$

$$(w + 6)(2w - 3) \left[ \frac{4w + 92}{(w + 6)(2w - 3)} \right] = 1 \cdot (4w + 92)$$

**Answer:**  $w = -4$  or  $\{-4\}$

Back to [Problem 2](#).

2e.  $\frac{3}{2x - 5} = \frac{2}{3 - 7x}$

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NOTE:  $x \neq \frac{5}{2}, x \neq \frac{3}{7}$

$$\text{LCD}(2x - 5, 3 - 7x) = (2x - 5)(3 - 7x)$$

$$\frac{3}{2x - 5} = \frac{2}{3 - 7x} \Rightarrow$$

$$(2x - 5)(3 - 7x) \left( \frac{3}{2x - 5} \right) = \left( \frac{2}{3 - 7x} \right) (2x - 5)(3 - 7x) \Rightarrow$$

$$3(3 - 7x) = 2(2x - 5) \Rightarrow 9 - 21x = 4x - 10 \Rightarrow 19 = 25x \Rightarrow$$

$$x = \frac{19}{25}$$

**Answer:**  $x = \frac{19}{25}$  or  $\left\{ \frac{19}{25} \right\}$

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Solving using cross multiplication:

$$\frac{3}{2x - 5} \begin{array}{c} \swarrow \nearrow \\ \nearrow \swarrow \end{array} \frac{2}{3 - 7x} \Rightarrow 3(3 - 7x) = 2(2x - 5)$$

3a.  $A = \frac{1}{2}h(b_1 + b_2)$  for  $b_1$

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$$A = \frac{1}{2}h(b_1 + b_2) \Rightarrow 2A = h(b_1 + b_2) \Rightarrow 2A = hb_1 + hb_2 \Rightarrow$$

$$2A - hb_2 = hb_1 \Rightarrow b_1 = \frac{2A - hb_2}{h}$$

**Answer:**  $b_1 = \frac{2A - hb_2}{h}$

3b.  $y = mx + b$  for  $x$

Back to [Problem 3](#).

$$y = mx + b \Rightarrow y - b = mx \Rightarrow x = \frac{y - b}{m}$$

**Answer:**  $x = \frac{y - b}{m}$

4a.  $\sqrt{-5} \sqrt{-15}$

Back to [Problem 4](#).

$$\sqrt{-5} \sqrt{-15} = i\sqrt{5} i\sqrt{15} = i^2 \sqrt{75} = -1\sqrt{25} \sqrt{3} = -1 \cdot 5\sqrt{3} = -5\sqrt{3}$$

**Answer:**  $-5\sqrt{3}$

4b.  $\frac{\sqrt{-96}}{\sqrt{6}}$

Back to [Problem 4](#).

$$\frac{\sqrt{-96}}{\sqrt{6}} = \frac{i\sqrt{96}}{\sqrt{6}} = i \frac{\sqrt{96}}{\sqrt{6}} = i \sqrt{\frac{96}{6}} = i\sqrt{16} = 4i$$

**Answer:**  $4i$

5.  $\frac{7}{3} - 9i$

Back to [Problem 5](#).

**Answer:** Real part:  $\frac{7}{3}$       Imaginary part:  $-9$