

1. Simplify the radicals. Assume all variables represent positive real numbers.

a. (10 pts)  $\frac{\sqrt{27x^{13}}}{\sqrt{y^6}}$

$\frac{3\sqrt{27}}{3\sqrt{9}} = \frac{3}{3}$

$$= \frac{\sqrt{3^2 \cdot 3 \cdot x^{12} \cdot x}}{y^6}$$

$$= \frac{3x^6}{y^3} \sqrt{3x}$$

b. (10 pts)  $\frac{\sqrt[3]{27x^{13}}}{\sqrt[3]{y^6}}$

$$= \frac{\sqrt[3]{3^3 \cdot x^{12} \cdot x}}{y^6}$$

$$= \frac{3x^4}{y^2} \sqrt[3]{x}$$

100  
100  
200 ✓

2. (20 pts) Solve  $|2x - 4| < 7$ . Give your answer in both set-builder and interval notation.

$$2x - 4 < 7 \quad \text{and} \quad 2x - 4 > -7$$

$$2x < 11 \quad \text{and} \quad 2x > -3$$

$$\left\{ x \mid x < \frac{11}{2} \quad \text{and} \quad x > -\frac{3}{2} \right\}$$

yes

$$x \in \left( -\frac{3}{2}, \frac{11}{2} \right)$$

$$\begin{array}{r} 2 \overline{)169344} \\ \underline{204672} \phantom{00} \\ 2142336 \phantom{00} \\ \underline{2211680} \phantom{00} \\ 2105840 \phantom{00} \\ \underline{2152920} \phantom{00} \\ 2264600 \phantom{00} \\ \underline{3132300} \phantom{00} \\ 3441000 \phantom{00} \\ \underline{3147000} \phantom{00} \\ 749000 \phantom{00} \\ \underline{700000} \phantom{00} \\ 700000 \phantom{00} \\ \underline{700000} \phantom{00} \\ 0 \phantom{00} \end{array}$$

3. (10 pts) Simplify  $\sqrt{169344}$ . I'm looking for an answer involving radicals. You may use your calculator to help break it down, but a decimal approximation will earn a ZERO.

$$\sqrt{2^7 \cdot 3^3 \cdot 7^2} = \sqrt{2^6 \cdot 2 \cdot 3^2 \cdot 3 \cdot 7^2}$$

$$= 2^3 \cdot 3 \cdot 7 \sqrt{2 \cdot 3} = \boxed{168\sqrt{6}}$$

4. Solve  $x^2 - 4x - 12 = 0$  in 3 ways:

a. (10 pts) Quadratic formula

$$a=1, b=-4, c=-12$$

$$\begin{aligned} b^2 - 4ac &= (-4)^2 - 4(1)(-12) \\ &= 16 + 48 \\ &= 64 \end{aligned}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{4 \pm \sqrt{64}}{2(1)}$$

$$= \frac{4 \pm 8}{2} = 2 \pm 4$$

$$2+4=6$$

$$2-4=-2$$

$$\boxed{\{-2, 6\}}$$

b. (10 pts) Factoring

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

$$x \in \boxed{\{-2, 6\}}$$

c. (10 pts) Completing the Square

$$x^2 - 4x = 12$$

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

$$(x-2)^2 = 16$$

$$x-2 = \pm 4$$

$$x = 2 \pm 4$$

$$2+4=6$$

$$2-4=-2$$

$$\boxed{\{-2, 6\}}$$

5. Find the least common denominator and use it to perform the indicated addition:

a. (10 pts)  $\frac{11}{30} + \frac{47}{108}$

$$= \left( \frac{11}{2 \cdot 3 \cdot 5} \right) \left( \frac{2 \cdot 3^2}{2 \cdot 3^2} \right) + \left( \frac{47}{2^2 \cdot 3^3} \right) \left( \frac{5}{5} \right)$$

$$= \frac{(11)(18) + (47)(5)}{2^2 \cdot 3^3 \cdot 5} = \frac{198 + 235}{2^2 \cdot 3^3 \cdot 5}$$

$$LCD = 2^2 \cdot 3^3 \cdot 5$$

$$= \frac{433}{2^2 \cdot 3^3 \cdot 5} = \boxed{\frac{433}{540}}$$

$$\begin{array}{r} 2 \overline{)108} \\ 2 \overline{)54} \\ 3 \overline{)27} \\ 3 \overline{)9} \\ 3 \end{array}$$

433

b. (10 pts)  $\frac{x-1}{(x+1)(x-3)} + \frac{2x+3}{(x-3)(x-2)}$

$$LCD = (x+1)(x-3)(x-2)$$

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

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

$$= \frac{x^2 - 3x + 2 + 2x^2 + 5x + 3}{LCD} = \frac{3x^2 + 2x + 5}{LCD}$$

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

6. (10 pts) Simplify  $\frac{2+3i}{2-3i}$ . Write your final answer in the form  $a+bi$ .

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

$$= \frac{4 + 12i - 9}{13} = \frac{-5 + 12i}{13} = \boxed{-\frac{5}{13} + \frac{12}{13}i}$$

7. (10 pts) Find an equation of the line through  $(-5, -3)$  and  $(-1, 5)$ . Point-slope form is preferred.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-3)}{-1 - (-5)} = \frac{8}{4} = 2$$

$(x_1, y_1)$     $(x_2, y_2)$

$$y - y_1 = m(x - x_1)$$

$$\boxed{y - (-3) = 2(x - (-5))}$$

STOP!

$$y + 3 = 2(x + 5)$$

$$y + 3 = 2x + 10$$

$$y = 2x + 7 \text{ Slope-int}$$

$$-2x + y = 7 \text{ Standard}$$

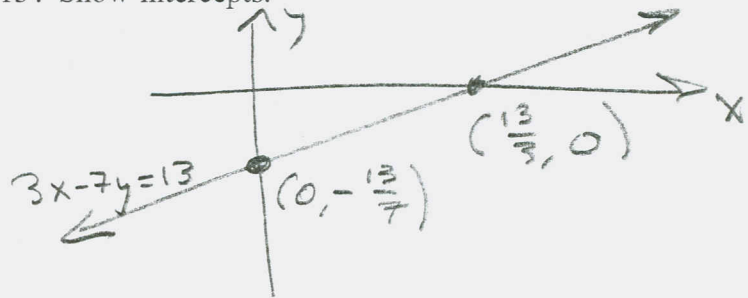
OR

$$2x - y = -7$$

8. (10 pts) Graph the line  $3x - 7y = 13$ . Show intercepts.

x	y
0	$-\frac{13}{7} = -1.857142857...$
$\frac{13}{3}$	0

$\frac{13}{3} = 4.333...$



9. (20 pts) It takes Ginette 5 hours to finish a job that Steve can do in 8 hours. How many hours will Ginette spend on the job if Steve joins her 1 hour after she starts alone and they work together until it's done?

Let  $x$  = the amt of time Ginette spends (in hours)

Then

$$\frac{1}{5}x + \frac{1}{8}(x-1) = 1$$

$$\text{LCD} = (8)(5) = 40$$

Times 40:  $8x + 5(x-1) = 40$

$$8x + 5x - 5 = 40$$

$$13x = 45$$

$$\boxed{x = \frac{45}{13} \text{ hrs}}$$

$n = 46153846...$

10. (20 pts) Graph the system of inequalities:

$$2x + 3y \leq 12$$

$$x - y \leq 4$$

$$x \geq 0$$

$$y \geq 0$$

$$2x + 3y \leq 12$$

x	y
0	4
6	0

$$0 \leq 12$$

(0,0) GOOD

$$x - y \leq 4$$

x	y
0	-4
4	0

$$0 \leq 4$$

(0,0) GOOD

