Practice Exam I solutions Halleck MAT 1275 Spring 2017

1. Simplify, leave answer without fractional or negative exponents

$$\left(\frac{4x^{1/2}y^{-2/3}}{x^2}\right)^{-1}=\frac{x^2}{4x^{1/2}y^{-2/3}}=\frac{x^{3/2}y^{2/3}}{4}=\frac{x\sqrt{x}\sqrt[3]{y^2}}{4}$$

2. Simplify, leave answer without radicals in denominator

$$\frac{\sqrt{6}+3\sqrt{5}}{3\sqrt{6}-\sqrt{5}}\cdot\frac{3\sqrt{6}+\sqrt{5}}{3\sqrt{6}+\sqrt{5}}=\frac{3\cdot 6+\sqrt{30}+9\sqrt{30}+3\cdot 5}{9\cdot 6-5}=\frac{18+10\sqrt{30}+15}{54-5}=\frac{33+10\sqrt{30}}{49}$$

3. Simplify (use method I)

$$\frac{\frac{5}{2}-\frac{5}{x}}{1-\frac{4}{x^2}}=\frac{\frac{x}{x}\cdot\frac{5}{2}-\frac{2}{2}\cdot\frac{5}{x}}{\frac{x^2}{x^2}\cdot\frac{1}{1}-\frac{4}{x^2}}=\frac{\frac{5x-10}{2x}}{\frac{x^2-4}{x^2}}=\frac{5x-10}{2x}\cdot\frac{x^2}{x^2-4}=\frac{5(x-2)}{2x}\cdot\frac{x^2}{(x-2)(x+2)}=\frac{5x}{2(x+2)}$$

4. Simplify (use method II)

$$\frac{\frac{2}{y^2+y}+\frac{1}{2y}}{\frac{4}{2y^2+2y}-\frac{1}{y+1}}=\frac{\frac{2}{y(y+1)}+\frac{1}{2y}}{\frac{4}{2y(y+1)}-\frac{1}{y+1}}=\frac{\frac{2y(y+1)}{1}\cdot\frac{2}{y(y+1)}+\frac{2y(y+1)}{1}\cdot\frac{1}{2y}}{\frac{2y(y+1)}{1}\cdot\frac{4}{2y(y+1)}-\frac{2y(y+1)}{1}\cdot\frac{1}{y+1}}$$

$$=\frac{4+(y+1)}{4-2y}=-\frac{y+5}{2(y-2)}$$

5. First simplify each radical, second perform the indicated operation and third simplify:

$$(-2\sqrt{3}+6\sqrt{50})(-\sqrt{8})=(-2\sqrt{3}+6\sqrt{25}\sqrt{2})(-\sqrt{4}\sqrt{2})=(-2\sqrt{3}+6\cdot 5\sqrt{2})(-2\sqrt{2})$$

$$=(-2\sqrt{3}+30\sqrt{2})(-2\sqrt{2})=4\sqrt{6}-60\cdot 2=4\sqrt{6}-120$$

6. Solve:

$x-\sqrt{7-3x}=1$	Check $x=-3$:	Check $x=2$:	
$x-1=\sqrt{7-3x}$	$(-3)-\sqrt{7-3(-3)}=1$	$(2)-\sqrt{7-3(2)}=1$	
$x^2-2x+1=7-3x$	$-3-\sqrt{7+9}=1$	$2-\sqrt{7-6}=1$	So sol'n is x = 2.
$x^2+x-6=0$	$-3-\sqrt{16}=1$	$2-\sqrt{1}=1$	
$(x+3)(x-2)$	$-3-4=1$	$2-1=1$	
Candidates: $\{-3, 2\}$	$-7=1$ False!	$1=1$ True!	

Extra:

i. Sam can shovel the snow in a driveway in 3 hours. Her younger sister Jude helps her one day and they complete the task in 2 hours. Working alone, how long would it take Jude? (You must use an equation with a variable in a denominator.)

Person or persons	sam	jude	together
time	3	j	2
Rate (portion of job completed in 1 hr)	1/3	1/*j*	1/2

We can't add the times, but we can add the rates:

$$\frac{1}{3}+\frac{1}{j}=\frac{1}{2}$$

LCD is 6*j*. Multiplying each term by the LCD:

$$\frac{6j}{1}\cdot\frac{1}{3}+\frac{6j}{1}\cdot\frac{1}{j}=\frac{6j}{1}\cdot\frac{1}{2}$$

$$2j+6=3j$$

$$6=j$$

Don't forget to finish with a sentence:

Working alone, it would take Jude 6 hours to shovel the snow.

ii. A bicyclist rides 30 mi against a wind and returns 30 miles with the wind. His average speed for the return trip is 5mph faster. How fast did the cyclist ride against the wind if the total time of the trip was 5 hr?

	R	T	D
Against wind	r	t	30
With wind	$r + 5$	$5 - t$	30

$$rt=30$$

$$(r+5)(5-t)=30$$

Solve the first equation for t and substitute into 2nd equation:

$$t=30/r$$

$$(r+5)(5-30/r)=30$$

$$5r-30+25-150/r=30$$

$$5r-35-150/r=0$$

This last equation is a rational equation with LCD r. Let's clear the denominator:

$$5r^2-35r-150=0$$

This is quadratic. Before we try to factor divide by the common factor 5:

$$r^2-7r-30=0$$

So we want two numbers which multiply to 30 but whose difference is 7:

$$(r-10)(r+3)=0$$

So we get as candidates for the solution: $\{-3,\ 10\}$

However, negative rates do not make any sense, so the answer is r = 10 mph. Finishing with a sentence:

The cyclist rode at rate of 10 mph against the wind.

iii. A professional mover is bringing a load into an apartment building that is 5 ft above the ground level. Her metal ramp is 20 ft long, find the horizontal distance from the loading dock to the end of the ramp exactly & to nearest in.

$$a^2+b^2=c^2$$

$$5^2+b^2=20^2$$

$$25+b^2=400$$

$$b^2=375$$

$$b=\sqrt{375}=\sqrt{25}\sqrt{15}=5\sqrt{15}\approx 19.365\text{ ft}\approx 19\ ft\ 4\ in$$

$$(12*.365=4.38)$$

The ramp is 19 ft 4 inches from the base of the loading dock.