## ALGEBRA PROBLEM SESSION \# 9 - PRACTICE PROBLEMS

## Rational Equations

1. (a) Decide whether $\frac{1}{5 x}=\frac{1}{9 x}$ and $5 \mathrm{x}=9 \mathrm{x}$ are equivalent equations and give a reason for your decision.
(b) Can we just multiply both sides of $\frac{1}{5 x}=\frac{1}{9 x}$ by the LCD?
2. Explain why is it necessary to check the solutions of a rational equation and then solve these equations.
$\frac{3}{x-3}=\frac{x}{x-3}-2$
$2-\frac{5}{y-3}=\frac{9}{y+1}$
$\frac{6 x}{x+1}=\frac{-1}{x+3}-\frac{12}{x^{2}+4 x+3}$

Solve:
3. $\frac{t-3}{5}=\frac{t}{7}-15$
4. $\frac{4}{n}+\frac{4}{n+3}=2$

## Formulas and Applications of Rational Equations

Solve each equation for the variable:

1. $\frac{1}{p}+\frac{1}{q}=\frac{1}{f}$ for q
2. $\quad I=\frac{E}{R+r}$ for R
3. An engine pulls a train 140 miles. Then a second engine, whose average rate is 5 miles per hour faster than the first engine, takes over and pulls the train 200 miles. The total time required for both engines is 9 hours. Find the average rate of engine.
4. A demolition company wants to build a brick wall to hide from public view the area where they store wrecked cars. Working together, an experienced bricklayer and an apprentice can build the wall in 12 hours. Working alone, it takes the apprentice 10 hours longer than the experienced bricklayer to do the job. How long would it take the experienced bricklayer to build the wall working alone?
5. You must leave for campus in half an hour, or you will be late for class. Unfortunately, you are snowed in. You can shovel the driveway in 45 minutes and your brother claims he can do it in 36 minutes. If you shovel together, how long will it take to clear the driveway? Will this give you enough time before you have to leave?
6. A moving sidewalk at an airport glides at a rate of 1.8 feet per second. Walking on the moving sidewalk, you travel 105 feet forward in the same time it takes to travel 50 feet in the opposite direction. Find your walking speed on nonmoving sidewalk. Round to the nearest tenth.
7. A pool can be filled by a pipe in 3 hours. It takes 3 times as long for another pipe to empty the pool. How long will it take to fill the pool if both pipes are open?
8. In still water, a boat average 8 miles per hour. It takes the same amount of time to travel 30 miles downstream, with the current, as 18 miles against the current. What is the rate of the water's current?

## Variation

1. As temperature increases on the Fahrenheit scale, it also increases on the Celsius scale. Is this direct variation? Explain.
2. As the cost of a purchase (less than \$5) increases, the amount of change received from a five-dollar bill decreases. Is this inverse variation? Explain.
3. $y$ varies inversely as $x . y=6$ when $x=3$. Find $y$ when $x=2$.

Selected problems were taken from Blitzer Algebra For College Students
4. $a$ varies directly as $b$ and inversely as the square of $c . a=7$ when $b=9$ and $c=6$. Find $a$ when $b=4$ and $c=8$.
5. $C$ varies jointly as $A$ and $T, C=175$ when $A=2100$ and $T=4$. Find $C$ when $A=2400$ and $T=6$.
6. An object's weight on the moon, M. varies directly as its weight on Earth, E. Neil Armstrong, the first person to step on the moon on July 20, 1969, weighed 360 pounds on Earth (with all of his equipment on) and 60 pounds on the moon. What is the moon weight of a person who weighs 186 pounds on Earth?
7. On a dry asphalt road, a car's stopping distance varies directly as the square of its speed. A car traveling at 45 miles per hour can stop in 67.5 feet. What is the stopping distance for a car traveling at 60 miles per hour?
8. The water temperature of the Pacific Ocean varies inversely as the water's depth. At a depth of 1000 meters, the water temperature is $4.4^{\circ}$ Celsius. What is the water temperature at a depth of 5000 meters?
9. The illumination provided by a car's headlight varies inversely as the square of the distance from the headlight. A car's headlight produces an illumination of 3.75 footcandles at a distance of 40 feet. What is the illumination when the distance is 50 feet?
10. One's intelligence quotient, or IQ, varies directly as a person's mental age and inversely as that person's chronological age. A person with a mental age of 25 and a chronological age of 20 has an IQ of 125. What is the chronological age of a person with a mental age of 40 and an IQ of 80 ?
11. Many people claim that as they get older, time seems to pass more quickly. Suppose that the perceived length of a period of time is inversely proportional to your age. How long will a year seem to be when you are three times as old as you are now?

## Radical Expressions and Functions

1. When is $\sqrt{x^{2}} \neq \mathrm{x}$ ?
2. If x is any real number, then $\sqrt[3]{x^{3}}=|\mathrm{x}|$ is not correct. Explain.
3. Evaluate: a. $\sqrt{0.49}$
b. $\sqrt{144+25}$

Evaluate:
4. $f(x)=\sqrt{x-3}$ for $f(28), f(4)$
5. $\mathrm{f}(\mathrm{x})=\sqrt[3]{\mathrm{x}-3}$ for $\mathrm{f}(30), \mathrm{f}(11)$
6. Find the domain of $f(x)=\sqrt{x+2}$

Simplify:
7. $\sqrt{(x-2)^{2}} \quad$ 8. $\sqrt{x^{2}+14 x+49}$
9. Find the cube root of: $\sqrt[3]{\frac{1}{1000}}$

Find the root and state if it is a real number:
10. $\sqrt[4]{81}$
11. $\sqrt[7]{-1}$

Simplify. Include absolute value bars where necessary.
12. $\sqrt[6]{\mathrm{y}^{6}}$
13. $\sqrt[3]{(-6)^{3}}$
14. A motorist is involved in an accident. A police officer measures the car's skid marks to be 45 feet long. Estimate the speed at which the motorist was traveling before braking. If the posted speed limit is 35 miles per hour and the motorist tells the officer she was not speeding, should the officer believe her? Explain.

