Lecture Guide

Math 90 - Intermediate Algebra

to accompany

Intermediate Algebra, 3rd edition

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6.1 – Introduction to Rational Expressions

1. Reduce: $\frac{5}{10}$

2. Simplify: $\frac{48a^2b^3}{8a^7b}$

⇨ When simplifying rational expressions, you are actually dividing both the numerator and the denominaror by common factors.

3. Simplify: $\frac{5x+10}{x+2}$

key phrase:_____

4. Simplify: $\frac{x^2-4x-32}{x^2-64}$

5. Simplify: $\frac{6p^2+12p}{2pq-4p}$

The " -1" Technique:

6. Simplify: $\frac{x-15}{15-x}$

7. Simplify: $\frac{16-x^2}{x-4}$

8. Simplify: $\frac{49-x^2}{x^2-10x+21}$

9. Simplify: $\frac{5}{20a-25}$

10. Simplify: $\frac{4t^2+16}{t^4-16}$

6.2 – Multiplying & Dividing Rational Expressions

*Multiply or divide as indicated. Simplify.

1. $\frac{2p-4}{6p} \cdot \frac{4p^2}{8p-16}$

2. $\frac{\frac{p^2-6p+8}{24}}{\frac{16-p^2}{6p+6}}$

3. $\frac{6a-6}{a^2+6a+5} \cdot \frac{a^2+5a}{12a}$

4. $\frac{x^2-xy-2y^2}{x+2y} \div \frac{x^2-4xy+4y^2}{x^2-4y^2}$

Domain of a rational function

The function *h* is defined below.

$$h(x) = \frac{x^2 - 6x - 27}{x^2 - 81}$$

Find all values of ***x*** that are NOT in the domain of ***h***. If there is more than one value, separate them with commas.

same directions....

$$f(x) = \frac{x + 7}{x + 8}$$

$g(x)=\frac{18}{x(x-4)}$

$$h(x) = \frac{x^2 + 4x}{x^2 - 16}$$

6.3 – Adding and Subtracting Fractions

Recall... when adding and subtracting fractions, you need to have a _____.

Add: $\frac{7}{8}+\frac{3}{5}$

*Find the least common multiple between each. Also state how many times each expression goes into the least common multiple.

1. $5x^2y^3$ and $6x^4y$

2. $3x+6$ and x^2-4

3. $5x-10$ and $10x+30$

4. x^2-x-6 and $3x-9$

5. $x+2$ and $x+4$

*Add or subtract. Simplify if possible.

6. $\frac{5}{x-2}+\frac{3}{x-2}$

7. $\frac{x+3}{x+4}+\frac{x-5}{x+4}$

8. $\frac{x+7}{x-3}-\frac{x+5}{x-3}$

9. $\frac{4}{3x-15}-\frac{x}{5-x}$

10. $\frac{4}{5xy^3} + \frac{2x}{15y^2}$

11. $\frac{6}{y-1} + \frac{9}{y}$

12. $\frac{4n}{n-8} - \frac{2n-1}{8-n}$

13. $\frac{6a}{a^2-b^2} + \frac{2a}{a^2+ab}$

14. $\frac{3x}{x^2+x-6} + \frac{x}{x^2+5x+6}$

15. $\frac{2n}{3n^2-8n-3} + \frac{1}{6-2n} - \frac{2}{3n+1}$

6.4 – Complex Fractions

1a. Way #1 $\dfrac{\frac{2x-10}{4}}{\frac{x^2-5x}{3x}}$

1b. Way #2 $\dfrac{\frac{2x-10}{4}}{\frac{x^2-5x}{3x}}$

2. $\dfrac{2+\frac{1}{x}}{4+\frac{1}{x}}$

3. $\dfrac{\frac{1}{m^2}+\frac{2}{3}}{\frac{1}{m}-\frac{5}{6}}$

4. $\dfrac{\frac{m}{7}-\frac{7}{m}}{\frac{1}{7}+\frac{1}{m}}$

5. $\dfrac{\frac{2}{p}+\frac{p}{2}}{\frac{p}{3}-\frac{3}{p}}$

6. $\dfrac{6+\frac{6}{k}}{1+\frac{1}{k}}$

7. $\dfrac{1+\frac{1}{x}-\frac{12}{x^2}}{\frac{9}{x^2}-\frac{3}{x}-2}$

8. $\dfrac{\frac{5}{b}+\frac{4}{b+1}}{\frac{4}{b}-\frac{5}{b+1}}$

Review of 6.1 – 6.4

1. Simplify: $\frac{x^2+5x}{x^2-25}$

2. Multiply: $\frac{x^2-x-6}{3x-9} \cdot \frac{5x+15}{10x+20}$

3. Add: $\frac{x+7}{x-1} + \frac{4}{2x-2}$

4. Subtract: $\frac{x-8}{x+4} - \frac{x+6}{x+4}$

5. Add: $\frac{3}{x^2-2x-24} + \frac{5}{x^2-16}$

6. Add: $\frac{x+1}{x+2} + \frac{x+3}{x+4}$

7. Simplify: $\frac{\frac{x}{x+2} - \frac{2}{x-2}}{\frac{x}{x+2} + \frac{2}{x-2}}$

6.5 – Rational Equations

Main Idea: Clear out the fractions by multiplying through on each side of the equation by the least common denominator.

Be careful to check that your solution(s) work. Make sure that when you substitute your solution into the problem, you don't get a zero in the denominator.

*Solve each of the following equations.

1. $\frac{4}{x} = \frac{3}{x} + \frac{1}{8}$

2. $\frac{x}{12} + \frac{x+3}{3x} = \frac{1}{x}$

3. $\frac{2}{4n-4} - \frac{7}{4} = \frac{-3}{n-1}$

4. $\frac{4x}{x+3} - \frac{12}{x-3} = \frac{4x^2+36}{x^2-9}$

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

6. $\frac{y+1}{2y} = \frac{2}{3}$

*Solve the following literal equations:

7. Solve $K = \frac{ma}{F}$ for a.

8. Solve $I = \frac{E}{R+r}$ for r.

When we learned to solve equations, we learned we could divide on each side of the equation:

However, unless you are dealing with literal equations (in which you are re-arranging an equation to solve for a different variable), you can not divide each side by a variable.

Incorrect:	Correct:

9. Solve $\frac{V}{\pi h} = r^2$ for h.

10. Solve $\frac{w-n}{wn} = P$ for w.

11. Solve $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$ for R.

6.6 – Proportions and Word Problems

A. Applications Involving Proportions

Key phrases: _____

or _____.

Key idea: Line up the units (either vertically or horizontally).

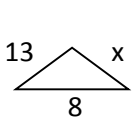
1. Pam drives her car 243 miles in city driving on 4.5 gallons of gas. At this rate, how many gallons are required to drive 621 miles?

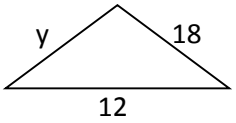
2. The ratio of men to women accountants in a large firm is 2 to 1. If the total number of accountants is 81, how many are men and how many are women?

B. Geometrical Figures

Similar triangles:

3. Find the values of x and y:





4. At the same time that a yardstick casts a 6 ft shadow, a tree casts a 30 ft shadow. How tall is the tree?

C. Distance Problems

5. Brooke walks 2 km/hr slower than her sister Anna. If Brooke can walk 12 km in the same time that Anna can walk 18 km, find their speeds.

6. A boat travels 60 miles to an island and 60 miles back again. Changes in the wind and tide make the average speed on the retrun trip 3 mph slower than on the way out. If the total time of the trip was 9 hours, find the speed in each direction.

D. Work Problems

7. Fred can paint his house in 30 hours. Barney can paint the same house in 50 hours. How long would it take if they worked together?

8. Gus works twice as fast as Sid. Together they can dig a garden in 4 hours. How long would it take each, working alone?

9. There are two machines that produce aluminum cans. The newer machine can produce 7200 cans in 180 minutes. It takes the older machine 360 minutes to produce that many cans. If the two machines work together, how long will it take them to produce 7200 cans?

10. A swimming pool holds 540,000 liters of water. The pool has two drainage pipes. When the pool is completely full, the first pipe alone can empty it in 225 minutes, and the second pipe alone can empty it in 150 minutes. When both pipes are draining together, how long does it take them to empty the pool?

11. It takes an older computer 4 times as long to send out a company's email as it does a newer computer. Working together, it takes the two computers 12 minutes to send out the email. How long will it take the older computer to send out the email on its own?

6.7 – Variation

Direct Variation

Inverse Variation

"k" is called the

* Write a variation model for each:

1. W varies directly as Z.

2. m varies inversely as t.

3. w varies jointly as p and f.

Find the value of k for each....

4. m varies directly as x and when x is 8, m is 22.

5. T is inversely proportional to x and when x is 40, T is 200.

Solve the following:

6. m varies directly as the square of x. If m=200 when x=20, find m when x=32.

7. The number of turkeys needed for a Thanksgiving dinner is directly proportional to the number of guests. If a cook knows that 3 turkeys will feed 42 guests, how many turkeys should he cook for 70 guests?

8. Suppose that the maximum weight that a certain type of rectangular beam can support varies inversely as its length and jointly as its width and the square of its height. Suppose also that a beam 4 inches wide, 3 inches high, and 18 feet long can support a maximum of 3 tons. What is the maximum weight that could be supported by a beam that is 7 inches wide, 4 inches high, and 6 feet long?

The force needed to keep a car from skidding on a curve varies inversely as the radius of the curve and jointly as the weight of the car and the square of the car's speed. Suppose that 245 pounds of force keeps a 2000-pound car from skidding on a curve of radius 600 ft at 35 mph . What force would keep the same car from skidding on a curve of radius 900 ft at 45 mph?

Some Chapter 6 Review Problems

1. What values of x are NOT in the domain of $g(x) = \frac{x+9}{x^2-2x-24}$?

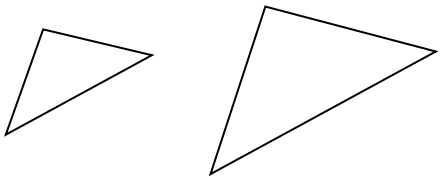
2. Add: $\frac{5}{x-3} + \frac{2}{x}$

3. Simplify: $\frac{\frac{6}{x^2} - \frac{2}{3x}}{\frac{4}{x} - \frac{2}{x^2}}$

4. Solve: $\frac{x+1}{3} - \frac{x-1}{6} = \frac{1}{6}$

5. Solve: $\frac{1}{x+2} = \frac{4}{x^2-4} - \frac{1}{x-2}$

6. Find x and y.



7. Hose A can fill a pool in 10 hours. Hose B can fill it in 12 hours. How long would it take if both hoses worked together?

8. The current in Lazy River is 2 mph. If one motors upstream 12 miles in the time it takes to motor 20 miles downstream, what is the speed of the boat in still water?

9. If T varies inversely as x and when x=40, T=200, find T when x=50.