Test 3 – Review

1. Factoring.
   a) \(4x^3 - x = \) _________
   b) \(x^2 - 2x - 48 = \) _________
   c) \(8x^3 + x^3 = \) _________
   d) \(4 + 9x^2 = \) _________

2. Reduce each of the following fractions to simplest form.
   a) \(\frac{3-x}{x^2-9} = \) _________
   b) \(\frac{x+2}{x^3+8} = \) _________
   c) \(\frac{4x-8}{x^2+x-6} = \) _________
   d) \(\frac{1}{1-\frac{2}{x-1}} = \) _________

3. Perform the given operation and reduce to simplest form.
   a) \(\frac{4}{x+2} \cdot \frac{x^2+2x}{x} = \) _________
   b) \(\frac{x^2-1}{5x-5} \cdot \frac{5}{x^2+5x+4} = \) _________
   c) \(\frac{x^2+8x+15}{x^2-4x-21} \div \frac{x+5}{x^2-3x-28} = \)
   d) \(\frac{25x^2-1}{10x^2+17x+3} + (1-5x) = \)
   e) \(\frac{2}{a} - \frac{a-2}{a} = \) _________
   f) \(\frac{x}{x^2-1} + \frac{1}{x^2-1} = \) _________
   g) \(\frac{3x}{x+3} - \frac{x-6}{x+3} = \)
4. \( \frac{x}{x+1} - \frac{2}{3} = \quad \)

\( \frac{1}{x+2} - \frac{1}{x+3} = \quad \)

\( \frac{x+2}{x-5} \frac{5x+31}{x^2-2x-15} = \quad \)

\( \frac{x+3}{x-6} + \frac{x-1}{x^2-2x-24} = \quad \)

\( \frac{3}{x} + \frac{5}{y} \cdot \frac{4y}{3x} = \quad \)

\( \frac{1}{x^2-x-2} \left( \frac{1}{x+1} + \frac{3}{x-2} \right) \)
5. Complex fractions

\[
\frac{\frac{1}{a}}{\frac{1}{a^2}} = \frac{\frac{1}{a}}{\frac{1}{a^2}} = \frac{4}{x} = \_
\]

\[
\frac{1}{x} - \frac{1}{y} = \frac{1}{xy} = \_
\]

\[
\frac{1/3 + 1/a}{1/b} = \frac{1}{x+2} - \frac{1}{2} = \_
\]

\[
\frac{1}{x+y} - \frac{1}{y} = \frac{1}{x^2 - y^2} = \_
\]

\[
\frac{3}{2x} = \frac{4}{5} \quad \frac{1}{x} - \frac{3}{2x} = 5
\]

3. \(\frac{6}{232}\)

\[
\frac{4}{x} + \frac{1}{2x} = \frac{9}{4}
\]

4. \(\frac{11}{232}\)

\[
\frac{1}{x+1} = \frac{2}{1-x^2}
\]

5. \(\frac{14}{233}\)

\[
\frac{1}{x^2 - 3x} = \frac{2}{x^2 - 9}
\]

6. \(\frac{17}{233}\)

\[
\frac{x}{x+4} - \frac{x}{x-4} = \frac{x+18}{x^2 - 16}
\]

7. Word Problems with fractional equations (equations with fractions)

1. \(\frac{22}{233}\)

In a fraction the numerator is three less than the denominator. If one is added to both the numerator and the denominator, the value of the resulting fraction is \(\frac{5}{6}\). Find the original fraction.
2. 27/234
An experienced bricklayer and his apprentice can build a wall together in 3 hours. It would take the apprentice 12 hours to do the job alone. How long would it take the experienced bricklayer to do the job alone?

3. 30/235
A drain can empty a tank in 4 hours. Pump A can fill the tank in 6 hours and pump B can fill it in 8 hours. If both pumps are working together and the drain is accidentally left open, how long will it take to fill the tank?

8. Exponents
1. Rewrite using only positive exponents and simplify.
   a) \((2x)^2 = \) ________  
   b) \(4^2 = \) ________

   c) \((2 + b)^{-1} = \) ____________  
   d) \(a^{-1} + b^{-1} = \) ____________

   e) \(2x^4 \cdot x^{10} = \) ____________  
   f) \((3x^{-2})^3 = \) ____________

   g) \(\frac{x^{-4}}{x^9} = \) ____________  
   h) \(\frac{4^2 \cdot 4^6}{4^5} = \) ____________
2. More examples with exponents.

a) \( \frac{x^{-4} y^3}{2x^{-6} y^{-4}} = \) __________

b) \( \left( \frac{2 \cdot 4^0}{7^{-2}} \right)^0 = \) __________

c) \( ( -2x^3)^2(3x^{-1})^2 = \) __________

d) \( (x^4 + 2^3)^4 \)

e) \( \frac{x^{-1} + y^{-1}}{1^{-1}} \) \( \) \( 2 \) \( \) \( 3 \) \( )^2 = \) __________

9. Scientific Notation

1. Write in scientific notation

21000 = __________

0.0000120 = ______________

2. Write in standard form

\( 1.20 \times 10^4 = \) ______________

\( 2.1 \times 10^{-2} = \) ______________

3. Multiply and divide by using the rules of exponents – leave your final answer in scientific form. Without the use of a calculator.

\( 2.3 \times 10^3 \cdot 5 \times 10^2 = \) ______________

\( 1.4 \times 10^{-2} \cdot 5 \times 10^4 = \) ______________

\( \frac{2.10 \times 10^3}{7.0 \times 10^6} = \) ______________

\( \frac{2.436 \times 10^{-2}}{1.2 \times 10^4} = \) ______________

10. Find each of the following roots without the use of a calculator.

\( \sqrt{49} = \) _____

\( \sqrt[3]{-8} = \) __________

\( \sqrt[4]{16} = \) __________

\( \sqrt{-4} = \) ___