

Montgomery College  
**Department of Mathematics**  
Rockville Campus

**MA091 ICL**  
**PREPARATION AND REVIEW FOR EXAM 2**  
Spring 2009

**Part 1: STUDY QUESTIONS**

- (Lesson 16) Which of the following expressions is *not* factorable?
  - $x^2 + 25$
  - $x^2 - 25$
  - $x^2 + 10x + 25$
  - $x^2 - 10x + 25$

(a) Suppose  $a$  is any constant. In general, which of the following expressions are factorable? (Do the factoring.) Which *never* factors?

  - $x^2 + a^2$
  - $x^2 - a^2$
  - $x^2 + 2ax + a^2$
  - $x^2 - 2ax + a^2$
- (Lesson 17) If  $a$  is any constant, and the expression  $x^2 + ax - 12$  is factorable, what can you say about the signs in the factors?  
If  $a$  is any constant, and the expression  $x^2 + ax + 20$  is factorable, what can you say about the signs in the factors?
- (Lesson 21) Consider the equations
  - $9 = 2x^2 + 17x$
  - $x^2 + 24 = 11x$
  - $x^2 - 4x = 24 - 2x$What is the first step in each solution?
- (Lesson 21) What's the best way to start solving  $12x^2 + 20x - 8 = 0$  ?
- (Lesson 22) In the expression  $\frac{x-1}{x+4}$ ,
  - could  $x = 0$  ?
  - Explain why we cannot have  $x = -4$ .
- (Lesson 23) Which of the following fractions can *not* be reduced? Explain.  
 $\frac{3}{6x-6}$ ,  $\frac{3x+5}{5x+3}$ ,  $\frac{x+1}{x^2-1}$

## Answers to Part I

- $x^2 + 25$  and  $x^2 + a^2$  are not factorable. Note that the sum of squares  $x^2 + 25$  is not factorable, while the sum of squares  $4x^2 + 100$  has a common factor of 4 so its complete factorization is  $4(x^2 + 25)$ .
- The factors will contain opposite signs, i.e.  $(x + \_)(x - \_)$   
(b) The factors will contain the same signs,  $(x + \_)(x + \_)$  or  $(x - \_)(x - \_)$
- Begin by collecting like terms and arranging the equation in the standard form  $ax^2 + bx + c = 0$ .
- Each coefficient is divisible by 4, so begin by dividing both sides of the equation by 4. This simplifies the factoring you need to do to complete the solution.
- (a) There is no difficulty if  $x = 0$ : the value of the fraction is then  $-\frac{1}{4}$ .  
(b) If  $x = -4$ , then the value of the expression in the denominator is 0, and division by zero is not defined.
- The fraction  $\frac{3x+5}{5x+3}$  cannot be reduced. Neither numerator nor denominator is factorable, so there can be no division of common factors.

## Part II: Practice Problems

The first four problems review concepts that are from lessons covered in exam #1 which are also included on exam #2.

1 (Lesson 1) Solve the fractional equations for  $x$ . Write the answers as fractions.

(a)  $\frac{2}{3}x + \frac{1}{4} = 2$       (b)  $\frac{1}{7}x - \frac{3}{14} = 1$       (c)  $\frac{1}{2}x + \frac{1}{3} = 2$

2 (Lesson 2) Solve the inequalities for  $x$  and graph the solution set.

(a)  $2 - 3x < 14$       (b)  $5 - 2x \geq -1$       (c)  $-3 + 2x \geq -9$

3 (Lesson 7) Simplify and write the answers using positive exponents only.

(a)  $\left(\frac{x^2}{y^3}\right)^{-4}$     (b)  $\left(\frac{x^{-2}}{y^3}\right)^{-4}$     (c)  $\left(\frac{x^2}{y^{-3}}\right)^{-4}$     (d)  $\left(\frac{x^{-2}}{y^{-3}}\right)^{-4}$     (e)  $(a^3b^{-7})^{-2}$     (f)  $\frac{1}{(a^3b^{-7})^{-2}}$

4 (Lesson 13) Find the product and simplify.

(a)  $(a+3b)^2$       (b)  $(x-3)^2$       (c)  $(2x-3)^2$       (d)  $(2x-3y)^2$

5 (Lesson 15) Remove the greatest monomial factor from each polynomial:

(a)  $3x^3 - 6x^2 + 12x$       (b)  $8x^4 - 12x^3 - 4x^2$       (c)  $a^3b^2 - 2a^3b + a^2b$

6 (Lessons 16, 17) Factor each expression completely, if possible.

(a)  $x^2 - 8x + 16$       (b)  $x^2 + 16$       (c)  $x^2 - 6x - 16$   
(d)  $x^2 - 16$       (e)  $x^2 - 17x + 16$       (f)  $x^2 + 10x + 16$

7 (Lessons 18, 19) Factor each expression completely:

(a)  $2x^2 + 7x + 6$       (b)  $2x^2 + 8x + 6$       (c)  $2x^4 + 16x^2$   
(d)  $4x^3 - 16x$       (e)  $6x^2 - x - 12$       (f)  $4x^2 + 4x - 15$   
(g)  $4x^2 - 17x + 15$       (h)  $4x^2 - 17x - 15$

8 (Lesson 21) Solve each equation for  $x$ :

(a)  $x^2 = 5x + 24$       (b)  $4x^2 + 20x + 25 = 0$       (c)  $3x^2 = 7x$   
(d)  $3x^2 - 13x + 4 = 0$       (e)  $9x^2 = 64$       (f)  $\frac{3}{4}x - \frac{1}{8} = 2$

9 (Lesson 22) State the value(s) of  $x$  for which the given expression is undefined:

(a)  $\frac{x+1}{x+6}$       (b)  $\frac{2x+3}{3x+7}$       (c)  $\frac{x}{x^2 - x - 6}$

10 (Lesson 23) Reduce each fraction to its simplest form:

(a)  $\frac{15x^2}{10x^6}$       (b)  $\frac{6x+12}{3x+12}$       (c)  $\frac{x-3}{x^2 - x - 6}$       (d)  $\frac{4-x}{x^2 - 4x}$

11 (Lesson 24) Simplify the fractions, then multiply:

(a)  $\frac{12x^2}{5y} \cdot \frac{y^2}{3x^5}$       (b)  $\frac{x^2 - 2x}{x^2 - 1} \cdot \frac{x+1}{2x-4}$       (c)  $\frac{x^2 + 9}{9x} \cdot \frac{3x^2 + 9x}{x^2 - 9}$

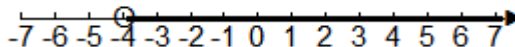
12 (Lesson 25) Divide the fractions as indicated. Your answer should be in simplest form.

(a)  $\frac{3x^4}{2y^2} \div \frac{15x^5}{20y^5}$       (b)  $\frac{x^2 - 1}{x^2 - x - 2} \div \frac{x^2 + x - 2}{x+2}$       (c)  $\frac{x^2 - 4}{2x^2 - 4x} \div \frac{x^2 + 4}{4x^2}$

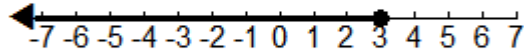
### Answers

1. (a)  $x = \frac{21}{8}$       (b)  $x = \frac{17}{2}$       (c)  $x = \frac{10}{3}$

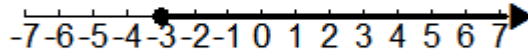
2. (a)  $x > -4$



(b)  $x \leq 3$



(c)  $x \geq -3$



3. (a)  $\frac{y^{12}}{x^8}$  (b)  $x^8 y^{12}$  (c)  $\frac{1}{x^8 y^{12}}$  (d)  $\frac{x^8}{y^{12}}$  (e)  $\frac{b^{14}}{a^6}$  (f)  $\frac{a^6}{b^{14}}$
4. (a)  $a^2 + 6ab + 9b^2$  (b)  $x^2 - 6x + 9$  (c)  $4x^2 - 12x + 9$  (d)  $4x^2 - 12xy + 9y^2$
5. (a)  $3x(x^2 - 2x + 4)$  (b)  $4x^2(2x^2 - 3x - 1)$  (c)  $a^2b(ab - 2a + 1)$
6. (a)  $(x - 4)^2$  (b) Not factorable (c)  $(x - 8)(x + 2)$   
(d)  $(x + 4)(x - 4)$  (e)  $(x - 16)(x - 1)$  (f)  $(x + 2)(x + 8)$
7. (a)  $(x + 2)(2x + 3)$  (b)  $2(x + 1)(x + 3)$  (c)  $2x^2(x^2 + 8)$   
(d)  $4x(x + 2)(x - 2)$  (e)  $(2x - 3)(3x + 4)$  (f)  $(2x - 3)(2x + 5)$   
(g)  $(x - 3)(4x - 5)$  (h)  $(x - 5)(4x + 3)$
8. (a)  $x = 8, -3$  (b)  $x = -\frac{5}{2}$  (c)  $x = 0, \frac{7}{3}$   
(d)  $x = 4, \frac{1}{3}$  (e)  $x = \frac{8}{3}, -\frac{8}{3}$  (f)  $x = \frac{17}{6}$
9. (a)  $x = -6$  (b)  $x = -\frac{7}{3}$  (c)  $x = 3, -2$
10. (a)  $\frac{3}{2x^4}$  (b)  $\frac{2(x+2)}{x+4}$  (c)  $\frac{1}{x+2}$   
(d)  $-\frac{1}{x}$
11. (a)  $\frac{4y}{5x^3}$  (b)  $\frac{x}{2(x-1)}$  (c)  $\frac{x^2 + 9}{3(x-3)}$
12. (a)  $\frac{2y^3}{x}$  (b)  $\frac{1}{x-2}$  (c)  $\frac{2x(x+2)}{x^2 + 4}$