

# MATH119: College Algebra- Exam 1

Fall 2016

Net ID: \_\_\_\_\_

Name : \_\_\_\_\_ keys

Time Limit: 50 Minutes

Math 119 Section: 30

Instructor: Wenqiang Feng

This exam contains 6 pages and 10 problems, for a total of 100 points and 0 bonus points.

## Instructions:

- **You will need your clicker.** Specific instructions will be given on the pages that require your clicker.
- **Show work whenever possible.** Full credit will be awarded for correct answers with supporting work and correct notation.
- **No scrap paper allowed.** If more room is needed to show work for a problem, use the back of the page.
- **Simplify all answers.** Fractional answers should be reduced but not written as mixed numbers. Answers may be left with negative exponents.
- **Always use correct notation!**

## Test Environment Conditions:

- Cell phones and other internet capable devices must be **silenced** and **put away**. Students are not to access their phone or other internet capable device until after the test has been turned in.
- Hats with brims that obstruct the view of a students face/eyes (e.g. baseball caps) must be removed or turned around so that the obstruction is eliminated.
- Wrist wear such as watches, fitness trackers and items that are clearly not jewelry must be removed and put away (as noted in the syllabus).
- No Calculators.

Problem	Points	Score
1	5	
2	10	
3	10	
4	5	
5	15	
6	10	
7	10	
8	15	
9	10	
10	10	
Total:	100	

## Read and Sign Below.

### *The Honor Statement*

*An essential feature of the University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the University, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.*

Pledged \_\_\_\_\_

Problems 1-2 are **to be answered via Clicker**. Include the answer for each problem in the appropriate place on your paper in case there are technical issues with your clicker. If you experience technical issues, check the appropriate box on the cover page of the test.

1. (5 points) **TRUE** or **FALSE**.

- (a) (1 point)  $\sqrt[3]{-8}$  is not a real number. ☐ TRUE ☒ **FALSE**
- (b) (1 point)  $(a^m)^n = a^{m+n}$ . ☐ TRUE ☒ **FALSE**
- (c) (1 point)  $0.333\bar{3}$  is a real number. ☒ **TRUE** ☐ FALSE
- (d) (1 point) The degree of  $5x^3 + 4x + 1$  is 3. ☒ **TRUE** ☐ FALSE
- (e) (1 point) Let  $f(x) = -x^2 + 3x$ , then  $f(-2) = -2$ . ☐ TRUE ☒ **FALSE**

2. (10 points) Multiple choice. Circle the correct answer choice.

- (a) (2 points) Which of the following is an example of the Associative Property of Addition?  
**A.**  $2x + (4y - 5) = (2x + 4y) - 5$     B.  $2x + 4y = 4y + 2x$   
C.  $5(2x + 4y) = 10x + 20y$     D.  $2x + 4y = 2(x + 2y)$
- (b) (2 points) Which of the following is the correct interval notation for  $1 \leq x < 3$ ?  
A.  $[1, 3]$     **B.**  $[1, 3)$     C.  $(1, 3]$     D.  $(1, 3)$
- (c) (2 points) Convert  $\sqrt[3]{x^5}$  from radical form to rational exponent form.  
A.  $x^{-\frac{5}{3}}$     B.  $x^{\frac{3}{5}}$     **C.**  $x^{\frac{5}{3}}$     D.  $x^{-\frac{3}{5}}$
- (d) (2 points) Evaluate the expression  $-3^2$ .  
**A.**  $-9$     B.  $9$     C.  $-6$     D. Not a real number
- (e) (2 points) Evaluate the expression  $\sqrt{-36}$ .  
A.  $6$     B.  $-6$     C.  $-18$     **D. Not a real number**
- 
- 

3. (10 points) Use order of operations rules to evaluate the expression.

- (a) (5 points)  $\left(\frac{1}{5}\right)^2 + 3\left(\frac{1}{5}\right) - \frac{1}{5}$ .

**Solution:**  $\left(\frac{1}{5}\right)^2 + 3\left(\frac{1}{5}\right) - \frac{1}{5} = \frac{1}{25} + \frac{3}{5} - \frac{1}{5} = \frac{1}{25} + \frac{15}{25} - \frac{5}{25} = \frac{11}{25}$ .

- (b) (5 points) Explain how to use order of operations rules to evaluate  $2 + 6 \div (2 \cdot 3)$ .

**Solution:** According to **Please Excuse My Dear Aunt Sally** principle, we need to calculate  $() : (2 \cdot 3) = 6$ , then the division  $\div : 6 \div (2 \cdot 3) = 6 \div 6 = 1$ , finally calculate the addition  $+$ :  $2 + 6 \div (2 \cdot 3) = 2 + 1 = 3$ .

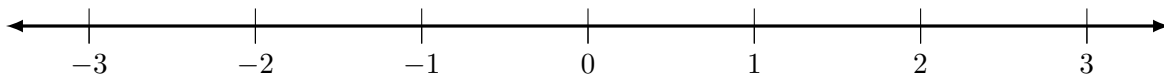
4. (5 points) Bounded and unbounded intervals on the Real number line.

(a) (2 points) Write the interval  $[-1, \infty)$  using inequality notation.

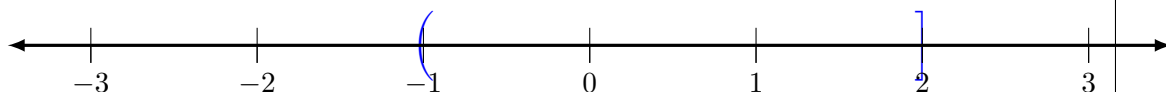
**Solution:**

$$x \geq -1$$

(b) (3 points) Sketch the graph of the interval  $-1 < x \leq 2$  on the following real number line.



**Solution:**



5. (15 points) Simplify the expression. Leave the answer with only positive exponents..

(a) (2 points)  $\left(2x^{\frac{2}{3}}\right)^3$

**Solution:**

$$\left(2x^{\frac{2}{3}}\right)^3 = 2^3 x^{\frac{2}{3} \cdot 3} = 8x^2$$

(c) (3 points)  $3x^{\frac{1}{2}} \cdot x^{-\frac{5}{2}}$

**Solution:**

$$3x^{\frac{1}{2}} \cdot x^{-\frac{5}{2}} = 3x^{\frac{1}{2} - \frac{5}{2}} = 3x^{-2} = \frac{3}{x^2}$$

(b) (5 points)  $\frac{3x^{\frac{1}{2}}}{6x^{\frac{5}{2}}}$

**Solution:**

$$\begin{aligned} \frac{3x^{\frac{1}{2}}}{6x^{\frac{5}{2}}} &= \frac{3}{6} x^{\frac{1}{2} - \frac{5}{2}} \\ &= \frac{1}{2} x^{-2} = \frac{1}{2x^2} \end{aligned}$$

(d) (5 points)  $(2x^2)^3 (x^{-3})^2$

**Solution:**

$$\begin{aligned} (2x^2)^3 (x^{-3})^2 &= 2^3 x^{2 \cdot 3} x^{-3 \cdot 2} \\ &= 8x^6 x^{-6} \\ &= 8x^{6+(-6)} = 8x^0 = 8 \end{aligned}$$

6. (10 points) Evaluate each expression. Write "Not a real number" if applicable.

(a) (2 points)  $-4^2$

**Solution:**

$$-4^2 = -16$$

(c) (3 points)  $\sqrt[3]{-8}$

**Solution:**

$$\sqrt[3]{-8} = \sqrt[3]{-2^3} = (-2^3)^{\frac{1}{3}} = -2$$

(b) (2 points)  $-\sqrt{36}$

**Solution:**

$$-\sqrt{36} = -\sqrt{6^2} = -6$$

(d) (3 points)  $16^{-\frac{1}{2}}$

**Solution:**

$$16^{-\frac{1}{2}} = \left(\frac{1}{16}\right)^{\frac{1}{2}} = \frac{1}{16^{\frac{1}{2}}} = \frac{1}{4}.$$

7. (10 points) Factor Completely.

(a) (5 points)  $x^3 + 2x^2 - x - 2$

**Solution:**

$$\begin{aligned} & x^3 + 2x^2 - x - 2 \\ &= (x^3 + 2x^2) - (x + 2) \\ &= x^2(x + 2) - (x + 2) \\ &= (x^2 - 1)(x + 2) \\ &= (x - 1)(x + 1)(x + 2) \end{aligned}$$

(b) (5 points)  $5x^2 - 8x + 3$

**Solution:** ac method:  $5 \cdot 3 = 15$ ,  
 $15 = -5 \cdot (-3)$  since  $-5 + (-3) = -8$

$$\begin{aligned} & 5x^2 - 8x + 3 \\ &= 5x^2 - 5x - 3x + 3 \\ &= 5x(x - 1) - 3(x - 1) \\ &= (5x - 3)(x - 1) \end{aligned}$$

8. (15 points) Perform the indicated operators and simplify.

(a) (5 points) Write  $(2x - 5)^2$  in standard form.

**Solution:**

$$\begin{aligned}(2x - 5)^2 &= (2x - 5)(2x - 5) \\&= 2x(2x - 5) - 5(2x - 5) \\&= 4x^2 - 10x - 10x + 25 \\&= 4x^2 - 20x + 25\end{aligned}$$

(b) (5 points) Write  $2x^3(5x - 1) - (1 + 5x^3 + 9x)$  in standard form.

**Solution:**

$$\begin{aligned}2x^3(5x - 1) - (1 + 5x^3 + 9x) &= 10x^4 - 2x^3 - (1 + 5x^3 + 9x) \\&= 10x^4 - 2x^3 - 1 - 5x^3 - 9x \\&= 10x^4 - 7x^3 - 1 - 9x \\&= 10x^4 - 7x^3 - 9x - 1\end{aligned}$$

(c) (5 points) Simply  $\frac{x^2-2x-3}{(x-4)^2} \cdot \frac{x^2-16}{x+1}$  and write out the domain restrictions.

**Solution:** To make the problem well defined, then the denominate is not equal to 0, i.e.  $(x - 4)^4 \neq 0$  and  $x + 1 \neq 0$ , hence

$$x \neq 4 \quad x \neq -1.$$

$$\begin{aligned}\frac{x^2 - 2x - 3}{(x - 4)^2} \cdot \frac{x^2 - 16}{x + 1} &= \frac{(x - 3)(x + 1)}{(x - 4)^2} \cdot \frac{(x + 4)(x - 4)}{x + 1} \\&= \frac{(x - 3)}{(x - 4)^2} \cdot \frac{(x + 4)(x - 4)}{1} \\&= \frac{(x - 3)}{(x - 4)} \cdot \frac{(x + 4)}{1} \\&= \frac{(x - 3)(x + 4)}{(x - 4)}\end{aligned}$$

9. (10 points) Perform the operation and simplify.

(a) (5 points) Evaluate the expression  $x^3 - 4y + \frac{8}{z}$  at  $x = -3, y = 2, z = \frac{1}{2}$ .

**Solution:**

$$\begin{aligned}(-3)^3 - 4 \cdot 2 + \frac{8}{\frac{1}{2}} &= -27 - 8 + 16 \\ &= -19\end{aligned}$$

(b) (5 points) Write the fraction  $\frac{x^5+3x^3-8}{x^2}$  as the sum or difference of two or more terms with no denominator (other than 1). You may need to rewrite using negative exponents.

**Solution:**

$$\begin{aligned}\frac{x^5 + 3x^3 - 8}{x^2} &= \frac{x^5}{x^2} + \frac{3x^3}{x^2} - \frac{8}{x^2} \\ &= x^3 + 3x - \frac{8}{x^2} \\ &= x^3 + 3x - 8x^{-2}\end{aligned}$$

10. (10 points) Suppose a company has the following revenue and cost equations where  $x$  is the quantity produced and sold:  $R = 80x$  and  $C = 50x + 400$ .

(a) (2 points) What is the fixed cost?

**Solution:** 400

(b) (2 points) What is the selling price of each item?

**Solution:** 80

(c) (3 points) Write and simplify the profit equation.

**Solution:**

$$\text{profit} = R - C = 80x - (50x + 400) = 30x - 400$$

(d) (3 points) What's the profit when we sold 30 products?

**Solution:**  $x = 30$ , then

$$\text{profit} = 30 \cdot 30 - 400 = 500$$