

QUIZ 1A

(CHAPTER 0: PRELIMINARY TOPICS)
MATH 141 – FALL 2019 – KUNIYUKI
90 POINTS TOTAL

No notes or books allowed. A scientific calculator is allowed. Simplify as appropriate.

Check one:

Can you easily print files from the class website?

Yes. I can print exam solutions.

No. Give me exam solutions in class.

You may assume that two-dimensional graphs are in the usual Cartesian xy -plane (distances in meters). Give exact answers, unless you are told to approximate.

SHORTER PROBLEMS (41 POINTS)

1) (1 point). The symbol \in means which of the following? Box in one:

For all

There exists

Is a member of

2) (6 points total).

a) Write the **converse** of this given statement:

“If I am taking 12 units, then I am a full-time student.”

b) Write the **contrapositive** of this given statement:

“If I am taking 12 units, then I am a full-time student.”

c) Which is logically equivalent to the given statement? Box in one:

Its converse

Its inverse

Its contrapositive

3) (2 points). Mathematically express the following as an absolute value inequality: The distance between x and 2 on the real number line is less than 5.

4) (4 points). Solve the absolute value inequality from Problem 3); that is, solve the correct answer to Problem 3). Write the solution set in interval form (the form with parentheses and/or brackets).

5) (3 points). Give the piecewise definition of $|a|$ (where $a \in \mathbb{R}$) given in class.

6) (2 points). Simplify $5^{3n} \cdot 5^{4n}$.

7) (4 points). Factor $2x^{-6} - x^3$ over \mathbb{Z} (that is, using only integer coefficients), as in class, and rewrite the result as a fraction with no negative exponents.

8) (3 points). Simplify completely: $\frac{x^2 - 16}{4 - x}$.

9) (1 point). Is $\sqrt{x^2 + 9}$ equivalent to $x + 3$? Box in one:

Yes

No

10) (1 point). Is $(3x + 6)^{1/2}$ equivalent to $3(x + 2)^{1/2}$, where $x \geq -2$? Box in one:

Yes

No

11) (2 points). What is the equation of the y -axis in the usual xy -plane?

12) (2 points). What is the slope of any line that is perpendicular to the line

$$y = -\frac{4}{3}x + 5?$$

13) (10 points total; 2 points each). Write the formulas for the following.

Description	Formula
The lateral surface area of a right circular cylinder with base radius r and height h	
The volume of a right circular cylinder with base radius r and height h	
The volume of a right circular cone with base radius r and height h	
The surface area of a sphere of radius r	
The volume of a sphere of radius r	

LONGER PROBLEMS (49 POINTS)

Show all work, simplify as appropriate, and use “good form and procedure” (as in class).
Box in your final answers!

14) Simplify $\frac{(-3x^2)^3}{x^{10}}$ completely. Your final answer must not have any negative exponents. (5 points)

15) Simplify completely: $\frac{x^3 + 27}{2x^2 + 5x - 3}$. (8 points)

16) (4 points). Fill in the boxes with real numbers in simplest form to make the statement correct.

$$\frac{4 - x^2}{\sqrt{x}} = 4x \boxed{} - x \boxed{} \quad (x > 0)$$

17) Find the **particular** model equation representing the following, as in class:
 t is directly proportional to p and inversely proportional to the cube of q ,
where t is 3 when p is 4 and q is 2.

(By “particular,” we mean determine the constant of proportionality.)

(5 points)

18) For parts a), b), and c), consider the points $P(-2, 3)$ and $Q(2, 8)$ in the usual xy -plane. Write all numerical constants in simplest form. Distance is measured in meters. (18 points total)

a) Find the distance between the two points (that is, the length of the line segment \overline{PQ}). (5 points)

b) Use part a) to find the standard form of the equation of the circle centered at the point $P(-2, 3)$ and passing through the point $Q(2, 8)$. (4 points)

c) Find the Slope-Intercept Form of the equation of the line \overleftrightarrow{PQ} that passes through the two points P and Q . Hint: You can do this part without using parts a) and b). (9 points)

- 19) Simplify the following expression completely, as in class.
Your final answer must be a single non-compound fraction with no nonpositive exponents. (You do not have to rationalize denominators.)
You may ignore domain issues here. (9 points)

$$\frac{x^3 \left[\frac{1}{2} (9 - x^2)^{-1/2} (-2x) \right] - (\sqrt{9 - x^2})(3x^2)}{x^6}$$