Math 141 Name: _____

QUIZ 1A

(CHAPTER 0: PRELIMINARY TOPICS)
MATH 141 – FALL 2021 – KUNIYUKI
90 POINTS TOTAL

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

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 (30 POINTS)

1) (1 point). The symbol $\exists$ 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 it is a hot day, then I want ice cream."

b) Write the **contrapositive** of this given statement:
"If it is a hot day, then I want ice cream."

c) Which is logically equivalent to the given statement? (Box in one.)
Its converse Its inverse Its contrapositive

3) (3 points). Simplify: $\dfrac{x(x+2)}{|x+2|}$ if $x < -2$.

4) (2 points). Mathematically express the following as an absolute value inequality: The distance between x and 3 on the real number line is less than 6.

5) (3 points). Solve the absolute value inequality from Problem 4); that is, solve the correct answer to Problem 4). Write the solution set in interval form (the form with parentheses and/or brackets).

6) (3 points). Factor completely over $\mathbb{Z}$ (that is, using only integer coefficients): $3x^4 - 14x^3 - 5x^2$.

7) (1 point). Is $\frac{1}{x} + \frac{1}{y}$ equivalent to $\frac{1}{x+y}$ (assuming nonzero denominators)?

Box in one: Yes No

8) (1 point). Is $\frac{x}{x+3} - \frac{y-1}{x+3}$ equivalent to $\frac{x-y-1}{x+3}$, where $x \neq -3$?

Box in one: Yes No

9) (2 points). Write an equation for the circle of radius 4 centered at the point $(-5, 3)$ in the usual *xy*-plane.

10) (8 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 **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 (60 POINTS)

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

11) Simplify completely: $\frac{2^{17n}}{2^{3n} \cdot \left(2^{4n}\right)^3}$. (4 points)

12) Factor $9x^{-5} - 4x^{-3}$ completely over $\mathbb{Z}$ (that is, using only integer coefficients), as in class, and rewrite the result as a single fraction with no negative exponents. (5 points)

13) Simplify completely: $\dfrac{x^3 - 27}{3 - x}$. (5 points)

14) Fill in the boxes with real numbers in simplest form to make the statement correct. (6 points)

$$\frac{x^4 + 2x^{\frac{5}{2}} - 7}{\sqrt{x}} = x^{\square} + 2x^{\square} - 7x^{\square} \quad (x > 0)$$

15) A barrel in the shape of a right circular cylinder has volume 250 cubic feet and base radius 4 feet. Find the height of this cylinder. Write an exact answer, and include appropriate units. Also write an approximate answer in decimal form by rounding off to four significant digits. (6 points)

16) For parts a) through e), consider the points $P(-2, 3)$ and $Q(4, 5)$ in the usual *xy*-plane. Write all numerical constants in simplest form. Distance is measured in meters. (20 points total)

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

b) Find the midpoint of $\overline{PQ}$, the line segment with endpoints *P* and *Q*. (3 points)

c) Find the slope of the line $\overleftrightarrow{PQ}$ that passes through the two points *P* and *Q*. (4 points)

d) Find the Slope-Intercept Form of the equation of the line $\overleftrightarrow{PQ}$ that passes through the two points *P* and *Q*. (6 points)

e) What is the slope of any line in the *xy*-plane that is perpendicular to the line $\overleftrightarrow{PQ}$? (2 points)

17) Find the **particular** model equation representing the following, as in class:

"w varies directly as x and inversely as the square of r"

if w is 1 when x is 4 and r is 3. Make sure your model is in simplified form. (By "particular," we mean determine the constant of proportionality.)
(5 points)

18) 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)

$$\frac{(2x+3)^{1/2}(12x^2) - (4x^3-1)\left(\frac{1}{2}\right)(2x+3)^{-1/2}(2)}{2x+3}$$

YOU MAY USE THE BACK OF THIS SHEET.