Math 141 Name: _____

QUIZ 1A

(CHAPTER 0: PRELIMINARY TOPICS)
MATH 141 – FALL 2018 – 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 (48 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; 2 points each).

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

"If it is hot outside, then I want ice cream."

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

"If it is hot outside, 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). Give the piecewise definition of $|a|$ $(\text{where } a \in \mathbb{R})$ given in class.

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

5) (3 points). Solve the correct 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) (2 points). Factor completely over $\mathbb{Z}$ (that is, using only integer coefficients): $5x^2 - 11x + 2$.

7) (5 points). Factor completely over $\mathbb{Z}$: $2x^6 - 54x^3$.

8) (6 points). Factor completely over $\mathbb{Z}$: $x^{-7} - 4x^{-5}$, as in class. Write your final answer as a fraction with no negative exponents.

9) (1 point). A student says that $\frac{x+4}{x-3} - \frac{7-x}{x-3}$ is equivalent to $\frac{x+4-7-x}{x-3}$ for $x \neq 3$. Is the student correct? Box in one: Yes No

10) (6 points total). Fill in the boxes with simplified real numbers to make the statements correct.

a) $\frac{9x^2}{16} + 25y^2 = \frac{x^2}{\square} + \frac{y^2}{\square}$

b) $\frac{3-5x}{x^4} = 3x^{\square} - 5x^{\square} \quad (x \neq 0)$

11) (3 points). A circle in the *xy*-plane has equation $(x+1)^2 + (y-6)^2 = 16$.

a) What point is the center of this circle?

b) What is the radius of this circle?

12) (2 points). What is the slope of any line in the *xy*-plane that is perpendicular to the line $y = -4x + 9$?

13) (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 (42 POINTS)

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

14) Simplify $\dfrac{\left(-3x^2\right)^3}{x^{7/3} \cdot \sqrt[3]{x^2}}$ completely. (6 points)

15) 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)

$$\frac{x^4\left(\frac{1}{2}\right)(2x+5)^{-1/2}(2) - (2x+5)^{1/2}(4x^3)}{(x^4)^2}$$

16) For parts a) and b), consider the points $P(3,-4)$ and $Q(8,2)$ in the usual *xy*-plane. Write all numerical constants in simplest form. Distance is measured in meters. (14 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 Slope-Intercept Form of the equation of the line $\overleftrightarrow{PQ}$ that passes through the two points *P* and *Q*. Hint: This part can be done without part a). (9 points)

17) 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. (7 points)

18) d is directly proportional to the cube of x and inversely proportional to t. Find the **particular** model equation related to this statement if d is 11 when x is 2 and t is 3, as in class. Make sure your model is in simplified form. (By "particular," we mean determine the constant of proportionality.) (6 points)