MTH – 4105 – 1
EXPONENTS AND RADICALS

NAME:_____

DATE:_____

Duration: 2 hours 30 minutes

PRETEST

QUESTION 1 (5 marks)

Perform the following multiplication by applying the laws of exponents. Make sure that your answer contains only positive exponents. Show all the steps in the solution.

$$\left(a^5 b^{-1} c\right)^{\frac{4}{5}} \times \left(a^2 b c^4\right)^{-2}$$

QUESTION 2 (5 marks)

Perform the following division by applying the laws of exponents. Make sure that your answer contains only positive exponents. Show all the steps in the solution.

$$\left(-m^2 n^{-2}\right)^{-1} \div \left(m^{-\frac{1}{2}} n^{\frac{1}{2}} o\right)^4$$

QUESTION 3 (5 marks)

Simplify the following expression. Make sure that your answer contains only positive exponents. Show all the steps in the solution.

$$\left[\frac{x^{-3} y^2 z^{\frac{3}{5}}}{25 y^{-3} z^{-1}} \right]^{-3}$$

QUESTION 4 (5 marks)

Perform the following division. Make sure that your answer contains only positive exponents. Show all the steps in the solution.

$$\left(\frac{25}{b^2} \right)^3 \div \left(\frac{b^2}{25} \right)^{-2}$$

QUESTION 5 (5 marks)

Perform the following division by using scientific notation and the laws of exponents. Express your answer in scientific notation. **Show all the steps in the solution.**

$$\frac{0.000\ 003}{5 \times 10^7}$$

QUESTION 6 (10 marks)

Determine whether or not the following two expressions are equivalent by applying the laws of exponents. Show all the steps in the solution.

$$\left(\frac{27}{2}\right)^{-3} \times \left(\frac{8}{9}\right)^{4} \times \left(\frac{3}{8}\right)^{-2} \qquad \text{and} \qquad \left(\frac{3^3}{32}\right)^{-1} \times \left(\frac{4}{27}\right)^{4} \times \left(\frac{8}{9}\right)^{2}$$

Answer: The two expressions are thus equivalent.

Yes ☐

No ☐

QUESTION 7 (10 marks)

Among the following algebraic expressions, circle those that are equivalent. In the space provided under each expression, show how you arrived at your conclusion.

$\dfrac{2^4}{2^{-2}}y^6$	$\dfrac{4}{-\left(16y^6\right)}$	$64y^6$
$\left(4y^2\right)^3$	$\dfrac{1}{\left(2^6 y^6\right)^{-1}}$	$\dfrac{4y}{y^{-5}}$

QUESTION 8 (10 marks)

If $0 < a < 1$, determine whether the following statements are true or false by replacing the variable with the number of your choice.

A) $\quad \left(\dfrac{-1}{a}\right)^{-3} < 0$	B) $\quad \left(\dfrac{1}{a}\right)^{2} > \dfrac{1}{a^{-1}}$
True ☐ or False ☐	True ☐ or False ☐
C) $\quad (-a)^{-3} > 0$	D) $\quad a^{2} < a < 1$
True ☐ or False ☐	True ☐ or False ☐

QUESTION 9 (5 marks)

Perform the operations indicated in the expression below and simplify your answer. Show all the steps in the solution.

$$\sqrt{50} - \sqrt{4} - \sqrt{98}$$

QUESTION 10 (5 marks)

Perform the operations indicated in the expression below and simplify your answer. Show all the steps in the solution.

$$\left(-4\sqrt{2} + 3\right) \times \left(2\sqrt{32} - 6\right)$$

QUESTION 11 (5 marks)

Perform the operations indicated in the following expression. Simplify your answer and rationalize the denominator, if necessary. Show all the steps in the solution.

$$\frac{2\sqrt{54}}{-3\sqrt{125}}$$

QUESTION 12 (5 marks)

Perform the operations indicated in the following expression. Simplify your answer and rationalize the denominator, if necessary. Show all the steps in the solution.

$$\frac{4\sqrt{6}}{2\sqrt{6}-3}$$

QUESTION 13 (10 marks)

Determine whether or not the following two expressions are equivalent. Show all the steps in the solution.

$$\left(2\sqrt{2}+4\right)\left(3\sqrt{12}-5\right) \quad \text{and} \quad 2\sqrt{2}\left(3\sqrt{3}-5\right)+6\sqrt{3}\left(\sqrt{2}+4\right)-20$$

Answer: The two expressions are thus equivalent.

Yes ☐

No ☐

QUESTION 14 (5 marks)

Determine whether or not the following two expressions are equivalent by converting them to exponential form. Show all the steps in the solution.

$$y \sqrt[3]{\left(\frac{1}{y}\right)^{-4}} \quad \text{and} \quad \left(y^4\right)^{\frac{1}{6}} \cdot \sqrt[3]{y^5}$$

Answer: The two expressions are thus equivalent.

Yes ☐

No ☐

QUESTION 15 (10 marks)

Match each expression in the left-hand column with the equivalent expression in the right-hand column. In the space under each expression on the left, show how you arrived at your answers.

A) $\quad 5\sqrt{5} - \sqrt{5}$	
B) $\quad \dfrac{\sqrt{45}}{3\sqrt{2}}$	
C) $\quad \dfrac{1}{5^{-\frac{3}{2}}}$	
D) $\quad \dfrac{5^{\frac{3}{2}}}{5}$	

1) $\quad \dfrac{\sqrt{10}}{2}$

2) $\quad \sqrt{5}$

3) $\quad 5$

4) $\quad 4\sqrt{5}$

5) $\quad \dfrac{\sqrt{5}}{2}$

6) $\quad 5\sqrt{5}$

Answers:

A) _____

B) _____

C) _____

D) _____