Math 65, HW 9a Section 5.5 Name: ______________________________

Concept and Vocabulary Check:

1. The quotient rule for exponents states that $\frac{b^m}{b^n} =$ ______, $b \neq 0$. When dividing exponential expressions with the same nonzero base, __________________ the exponents.

2. If $b \neq 0$, then $b^0 =$ ______.

3. The quotients-to-powers rule for exponents states that $\left(\frac{a}{b}\right)^n =$ ______, $b \neq 0$. When a quotient is raised to a power, raise both the __________________ and the __________________ to the power.

4. To divide monomials, __________________ the coefficients and __________________ the exponents.

5. Consider the division problem:

$$\frac{20x^6y^4}{10x^2y} = 2x^4y^3.$$

   The polynomial in the numerator, $20x^6y^4$, is called the __________________. The polynomial in the denominator, $10x^2y$, is called the __________________. The simplified expression on the right side of the equal sign, $2x^4y^3$, is called the __________________.

6. To check the answer to a division problem, multiply the __________________ and the __________________. If this product is the __________________, the answer is correct.

7. To perform the division $\frac{20x^8 - 10x^4 + 6x^3}{2x^3}$, divide each term of ________________________ by ______.

Practice Exercises:

In Exercises 1, 3, 5 and 9, divide each expression using the quotient rule. Express any numerical answers in exponential form.

1. $\frac{3^{20}}{3^5}$

3. $\frac{x^6}{x^2}$

5. $\frac{y^{13}}{y^5}$

9. $\frac{x^{100}y^{50}}{x^{25}y^{10}}$

In exercises 13 - 23, use the zero exponent rule to simplify each expression.

13. $(-2)^0$

15. -2^0

19. $(100y)^0$

23. $-\pi^0 - (-\pi)^0$

In 25 - 51, simplify and/or divide as necessary.

25. $\left(\frac{x}{3}\right)^2$

29. $\left(\frac{2x^3}{5}\right)^2$

35. $\left(\frac{x^2y^3}{2z}\right)^4$

39. $\frac{-8x^{22}}{4x^2}$

45. $\frac{30x^7y^5}{5x^2y}$

51. $\frac{-5x^{10}y^{12}z^6}{50x^2y^3z^2}$

In exercises 53 - 81, divide the polynomial by the monomial. Check each answer by showing that the product of the divisor and the quotient is the dividend.

53. $\dfrac{10x^4 + 2x^3}{2}$

57. $\dfrac{y^7 - 9y^2 + y}{y}$

61. $\dfrac{18x^5 + 6x^4 + 9x^3}{3x^2}$

65. $(4x^2 - 6x) \div x$

69. $\dfrac{8x^3 + 6x^2 - 2x}{2x}$

73. $\dfrac{18x^7 - 9x^6 + 20x^5 - 10x^4}{-2x^4}$

77. $\dfrac{20x^7y^4 - 15x^3y^2 - 10x^2y}{-5x^2y}$

81. $\left(\dfrac{18x^2y^4}{9xy^2}\right) - \left(\dfrac{15x^5y^6}{5x^4y^4}\right)$

Applications:

87. The bar graphs (in the book on page 383) show U.S. film box office receipts, in millions of dollars, and box-office admissions, in millions of tickets sold, for five selected years. The following polynomial models of degree 2 can be used to describe the data in the bar graphs on the previous page.

$$R = 3.6x^2 + 158x + 2790 \qquad A = -0.2x^2 + 21x + 1015$$

where R is receipts, in millions of dollars, x represents the number of years after 1980 and A is admissions, in millions of tickets sold.

a. Use the data displayed by the bar graphs in the book to find the average admission charge for a film ticket in 2000. Round to two decimal places, or to the nearest cent.

b. Use the models to write an algebraic expression that describes the average admission charge for a film ticket x years after 1980.

c. Use the model from part (b) to find the average admission charge for a film ticket in 2000. Round to the nearest cent. Does the model underestimate or overestimate the actual average charge that you found in part (a)? By how much?

d. Can the polynomial division for the model in part (b) be performed using the methods that you learned in this section? Explain your answer.