Math 5e, Fall 2024 Homework 11

Homework #10 is due December 11

Instructions: Some of the problems we solved in class, and some are new. Please try to solve all problems, do your best, and show your work. Write on separate sheets of paper, not between the lines of this handout!

General notation (n is a whole number):

$$a^n = a \times a \times a \times \ldots \times a \ (n \text{ times})$$

Special cases:

$a^0 = 1$	read: a-to-the-zero
$a^1 = a$	is just itself 'a'
$a^2 = a \times a$	read: a-squared
$a^3 = a \times a \times a$	read: a-cubed

Product $a^n a^m = a^{n+m}$

Division $\frac{a^n}{a^m} = a^{n-m}$

$a^n = \frac{1}{a^{-n}}$ and $a^{-n} = \frac{1}{a^n}$

Power of a product $(ab)^n = a^n \times b^n$

Power raised to a power $(a^m)^n = a^{m \times n}$

1. Calculate and write the solution as a power.
   a) $(1^5)^4$; $(10^4)^2$; $\left(\left(\frac{2}{3}\right)^2\right)^2$
   b) $(x^4)^2 : (x^5)^3$;
   c) $\frac{(5^8)^2 \cdot 5^7}{5^{12}}$; $\frac{(2^5)^2}{2^6 \cdot 2}$; $\frac{3^7 \cdot 27}{(3^4)^3}$

2. Simplify the expressions:
   a) $(2z^2 . 3z^3 . z)^2$
   b) $(4c^2 . c^3)^3$
   c) $\left(\frac{5\,g^4 b^5}{4\,g^2 b^3}\right)^3$
   d) $\left(\frac{8dg^2}{3d^3 g^4}\right)^3$

3. Find the unknown, *x*:

   a) $|-52+48| = x$

   b) $|-52| + x = |48|$

   c) $|x| = 48$

   d) $|x-1| = 53$

4. Open the brackets:

   a) $(-a-b+3).3 =$

   b) $-b + b(x-1) =$

   c) $2(a-b) - 2(6-b+a) =$

   d) $(a+2)(a^2+a+2) - 2a(a-1) =$

   e) $(2y^3 - 3y + 2)(y-3) =$

   f) $(x+3)(x-3) - x(x-2) =$

5. Solve the equations:

   a) $5(3x-2) - (14x-8) = 18$

   b) $\frac{3}{4}x = \frac{3}{5}x + 3$

   c) $\frac{3}{x} = \frac{15}{4}$

6. Suppose that $100 is deposited into an account, and the amount doubles every 8 years. How much will be in the account after 40 years? Express your answer using powers.

7. At the beginning of an epidemic, 50 people are sick. If the number of sick people triples every other day, how many people will be sick at the end of 2 weeks? Express your answer using powers.

8. Find the unknown power.

   a) $4^m = (4^3)^2$

   b) $7^m = 49$

   c) $9^m = 3^6$