Math 5b: Homework 8 **November 10, 2019**

Power Rules

General notation (n is a whole number):

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

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

Properties:

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

Similarly:

$$a^n a^m = (a\times a\times a\ldots)\times(a\times a\times a\ldots) \quad (n \text{ and } m \text{ times, respectively})$$
$$a^n a^m = a\times a\times a\ldots\times a\times a \quad (n+m \text{ times})$$

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

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

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

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

Classwork

1. Simplify:
   a. $\frac{(x^2y^2)x^3}{x^2y^5}$
   b. $(3y^3 \bullet y^5)^2$
2. Let $a = 2\cdot 10^8$, $b = 10^5$. Compute
   a. $a^2\cdot b$,
   b. $\frac{a}{b}$,
   c. $a^2 \div b^3$ (Hint: use $(a\cdot b)^n = a^n b^n$ and $(a^n)^m = a^{mn}$).
3. It is known that $2^{10} = 1024$, which is very close to 10^3. Use this to estimate the value of 2^{20}, 2^{32}.
4. Solve:
   a. $2^{-4} \bullet \left(2^3 + 8^2\right) =$
   b. $6^3\cdot(3\cdot 2^{-3} + 2\cdot 3^{-3}) =$
   c. $15^2 \cdot (\frac{25}{3} - 3^3 \cdot 5^{-2}) =$

5. A student walks from home to a bus stop with 5km/h speed and have to wait 4 minutes for the bus. One day she walks with slower with 4km/h and misses her bus by 2 minutes. How far is the bus stop?
6. Solve the following equations:
   a. $17 - 5x = -10 - 2x$
   b. $4x - 2(1 - x) = -3x$
   c. $\frac{10-x}{x+5} = 4$
   d. $\frac{x-2}{x-8} - 2 = 1$

Homework

1. Solve the following equations:
   a. $5 - x = -4 - 2x$
   b. $7 - 2(1 - x) = -5$
   c. $\frac{x-13}{x+3} = 5$
   d. $\frac{x-6}{x+7} + 9 = 3$

2. Simplify:
   a. $\frac{(3^3 x^4 y^2)^2 x^2}{3 x^8 y}$
   b. $(2y^2 \cdot y^4)^3 / 2$
3. Let $a = 6$, $b = 9$. Compute
   a. $a^2 \cdot b$,
   b. $\frac{a^2}{b}$,
   c. $a^6 \div b^3$ (Hint: use $(a \cdot b)^n = a^n b^n$ and $(a^n)^m = a^{mn}$)
4. It is known that $2^{10} = 1024$, which is very close to 10^3. Use this to estimate the value of 2^{14}, 2^{25}.
5. If you take half my age and add 7, you get my age 13 years ago. How old am I?
6. How many cubic centimeters are there in one cubic kilometer? (1km = 1000m, 1m=100cm)
7. Evaluate:
   (a) $(x - 5)(2x + 1) =$

   (b) $(x + 7)(x^2 - 2x) =$

8. Solve:
   a. $2^{-2} \cdot (2^2 + 4^2) =$
   b. $6^3 \cdot (2^{-3} + 3^{-3}) =$
9. In July it rained twice as many days as in June, but 4 days fewer than in August. In total, it rained for three weeks in the Summer. How many days was it dry in June?
10. Simplify:
    a. $3x^2(y - 2x) + 2xy(3x - 5y) - y^2(4y - 3x) + 5(x^3 - y^3)$
    b. $12x(5 - y^2) - 8xy(3xy - x) + 3y^2(2x - 3x^2) - x^2(y + 1)$