The following formulas may or may not be useful:

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \qquad\qquad a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

1. Given the number $\sqrt[3]{-27}$, circle <u>all</u> of the following that describe the number.

      real   irrational   rational   natural   integer

2. Sketch the following intervals on the number line and write the answer in interval notation.

(a). $-3 \le x < 2$

(b). $(-\infty, 5) \cup (0, 6]$

3. Evaluate the following. Simplify and reduce fractions, when possible.

(a). $2.8 + (-5.8)$

(b). $\dfrac{(-2)(3)}{(-4)(-9)}$

(c). $\dfrac{6 - 4 \cdot 2}{-2^3 + 1}$

(d). $6 - (9 - (5 - 3))$

(e). $|4 + 6| - |4 - 6|$

(f). $1 - \dfrac{2}{5}$

(g). $\dfrac{1}{2} - \dfrac{2}{3} + \dfrac{5}{8}$

(h). $2 \div \dfrac{4}{9}$

(i). $\dfrac{1}{3} \cdot 2\dfrac{1}{2}$

(j). -2^4

(k). $\dfrac{2^3}{2^{-3}2^4}$

(l). $\dfrac{3 \cdot |3 - 4| + |-5|}{|3^2 - 2^2|}$

4. Evaluate the following powers and roots. If it is not a real number, clearly state so.

(a). $\sqrt{-81}$

(b). $\sqrt[5]{-32}$

(c). $36^{1/2}$

(d). $(-8)^{-2/3}$

5. Simplify the following. Use only positive exponents (i.e. no radicals, no negative exponents).

(a). $x^{-4}x^7$

(b). $\left(\dfrac{2x^2}{y^5}\right)^{-3}$

(c). $\left(\dfrac{3x^2y^{-1}}{3^3x^{-1}y^3}\right)^{-2}$

(d). $[(a^{-3}b^{-5})^{-1}]^2$

(e). $\dfrac{(2u^{-2}v^4)^3}{(10u^3v^2)^2}$

(f). $\left(2x^3y^2z^0\right)^2 \left(5x^{-2}yz^6\right)$

(g). $\left(7^{-1/2}\right)^{-2/3}$

(h). $\dfrac{2x^{3/2}}{5x^{1/2}y^{-2/3}}$

6. Simplify the following expressions and leave the radical sign in your answer. [Assume nonnegative variables.]

(a). $\sqrt{27a^4b^7}$

(b). $\sqrt[4]{2x^3y^4}\,\sqrt[4]{32xy^2}$

7. Rewrite the following in exponential form and simplify.

(a). $2x^2\sqrt{x}$

(b). $\sqrt[3]{m^4n^2}$

8. Write the following in radical form.

(a). $5x^{2/3}$

(b). $2x^{-1/2}$

9. Write the following in the form cx^n where c is a constant and n is a rational number (which may be negative).

$$\dfrac{3}{2x\sqrt{x}}$$

10. Rationalize the denominator and simplify. $\quad \dfrac{x}{\sqrt{2x^3}}$

11. Perform the indicated operations and simplify.

(a). $a - 1 + [3x - 2y - (4a - 3y + 4)]$

(b). $(2 - 3x^2)(1 + x^2)$

(c). $(a + b + c)(x + y)$

(d). $(x - 2y)(x + 2y)$

(e). $(4a + 3b)^2$

(f). $(x - 2)^3$

(g). $2x(x - 3)(4x - 1)$

(h). $\left(\dfrac{1}{3} + x^3\right)^2$

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

12. A rental boat costs $65 per day plus $5 per gallon of gasoline. If x is the number of gallons used, write an expression for the total cost of renting the boat for a day.