

## ASSIGNMENT 1 - MATH 112

(QUESTIONS BASED MATERIAL FROM THE *PREREQUISITES* CHAPTER OF YOUR TEXTBOOK)

- (1) Write the given intervals using inequalities.
  - (a)  $(4, \infty)$
  - (b)  $[-3, 9)$
- (2) Express the given inequalities using interval notation.
  - (a)  $x > -1$
  - (b)  $-10 < x \leq 8$
- (3) Evaluate each expression.
  - (a)  $\sqrt[3]{-125}$
  - (b)  $\sqrt{2}\sqrt{8}$
  - (c)  $64^{2/3}$
- (4) Write each expression as a power of  $x$ .
  - (a)  $\frac{1}{x^3}$
  - (b)  $(x^2x^m)^n$
  - (c)  $\frac{(\sqrt{x})^3x^a}{x^b}$
- (5) Simplify each expression.
  - (a)  $\frac{\sqrt{x}+1}{\sqrt{x}-1}$
  - (b)  $\left(\frac{ab^2c^{-3}}{2a^3b^{-4}}\right)^{-2}$
  - (c)  $|2 - |2 - | - 2|||$
- (6) Write the following numbers in scientific notation.
  - (a) 6,403,800,000,000,000
  - (b) 0.0000000000007513
- (7) Express the decimal  $0.\overline{246}$  as a fraction.
- (8) Factor each expression completely.
  - (a)  $y^3 - 2y^2 - y + 2$
  - (b)  $x^4 - 2x^2 + 1$
  - (c)  $8x^3 + y^6$

(d)  $a^4b^2 + ab^5$

(9) Perform the given operations.

(a)  $\frac{x^3+2x^2+3x}{x}$

(b)  $\frac{x^3/(x-1)}{x^2/(x^3-1)}$

(c)  $\frac{y^3-1}{y^2-1}$

(d)  $\frac{1}{x+2} + \frac{1}{x^2-4} - \frac{2}{x^2-x-2}$

(10) If  $t = \frac{1}{2} \left( x^3 - \frac{1}{x^3} \right)$  and  $x > 0$ , show that

$$\sqrt{1+t^2} = \frac{1}{2} \left( x^3 + \frac{1}{x^3} \right).$$

Why is it the requirement  $x > 0$  necessary in order for the final statement to be true?

(11) This problem demonstrates one of the most powerful techniques used in mathematics: noticing a pattern, and using that pattern to make a more general statement. Follow the steps below to derive a factorization of the  $n$ th-degree polynomial  $x^n - 1$ .

(a) Factor the expression  $x^2 - 1$ .

(b) Factor the expression  $x^3 - 1$ .

(c) Factor the expression  $x^4 - 1$ .

(d) Write down a factorization of  $x^n - 1$ , for any  $n \in \mathbb{N}$ , of the following form:

$$x^n - 1 = (x - 1)p$$

where  $p$  is an  $(n - 1)$ -degree polynomial in  $x$ .

*Hint:* Notice the desired form of the factorization in part (d). This indicates that it might not be fruitful to factor each expression in (a)-(c) completely. You only want to factor out the term  $(x - 1)$  in order to see the pattern.