

## REVIEW

### UNIT 1

FORMULAS TO MEMORIZE:

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}, \quad |x| \geq 0$$
$$(x + y)^2 = x^2 + 2xy + y^2$$
$$(x - y)^2 = x^2 - 2xy + y^2$$
$$x^2 - y^2 = (x - y)(x + y)$$
$$x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$
$$x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$
$$\sqrt{x^2} = |x|$$

1. Write without absolute value signs and simplify:

a)  $\frac{2x + |-x^2 - 1|}{x + 1}$       b)  $|\pi - 5| - |3 - \pi|$       c)  $3|12 - 4r| + |r - 1|$  if  $r > 3$

2. Let  $x = -1$  and  $y = 3$ . Evaluate:

a)  $\frac{|2x - y| + 16 \div 4 \div 2}{|y - x| - |x + y|}$       b)  $\frac{x^{-1} + y^{-2}}{x^{-4} - y^{-3}}$

3. Let  $A = \{\sqrt{2}, \frac{0}{3}, \sqrt{-4}, \pi, \sqrt[3]{-8}, \frac{0}{0}, \frac{3}{0}, \frac{15}{5}, \frac{1}{2}, 16^{\frac{1}{4}}\}$ .

List the elements that belong to each set: (a) Natural numbers, (b) Integers, (c) Rational numbers, (d) Irrational numbers, (e) Real numbers.

4. Perform the indicated operations and simplify:

a)  $\frac{x+1}{x-1} - \left(\frac{x+1}{x-1}\right)^{-1}$       b)  $\frac{1}{x^3 + 2x^2} - \frac{1}{x^3 + 4x^2 + 4x}$

5. Factor completely:

a)  $4x^2(x+2)^3 - 6x^3(x+2)^2 + 2x^2(x+2)^2$       b)  $4x^4 - x^2 - 16x^3 + 4x$   
c)  $x^4 - x^2 - 12$       d)  $32x^5 - 4x^2$

6. Reduce the fraction to the lowest terms. State the domain of the fraction.

$$\frac{12y^2 - 4y - 5}{6y^2 - y - 2}$$

7. Simplify each rational expression. Write all restrictions on the variable.

a)  $\frac{4x^2 - 4}{x^2 - x + 1} \cdot \frac{x^4 + x}{x^2 + 2x + 1}$       b)  $\frac{6x^2 + 5x - 6}{3x^2 - 2x} \div \frac{8x^3 + 27}{4x^3 - 6x^2 + 9x}$

8. Simplify each compound fraction. State the domains of the fractions in (a) and (b).

$$\begin{array}{lll} \text{a) } \frac{1 - \frac{4}{x} + \frac{4}{x^2}}{1 - \frac{5}{x} + \frac{6}{x^2}} & \text{b) } \frac{\frac{3}{x} - \frac{4}{x+1}}{1 - \frac{1}{x}} & \text{c) } \frac{x^3(1-x)^{-\frac{1}{2}} + x(1-x)^{\frac{1}{2}}}{x^2} \end{array}$$

9. Simplify each expression. Give your answer using only positive exponents.

$$\text{a) } \frac{27(-3xy^{-2})^{-3}}{x^2y^4} \quad \text{b) } \frac{x^{-2} - y^{-2}}{x - y} \quad \text{c) } \left( \frac{6x^{-\frac{3}{2}}y^{-1}}{8x^{\frac{1}{2}}y^{-2}} \right)^{-2}$$

10. Simplify and rationalize the denominator where it is necessary:

$$\text{a) } \sqrt[5]{\frac{-4x^{10}y^{12}}{64x^{-5}z^3y^{19}}} \quad \text{b) } \frac{x^2 - xy}{\sqrt{x} - \sqrt{y}} \quad \text{c) } \frac{2}{\sqrt{10} - \sqrt{8}}$$

11. Simplify each radical expression (where it is possible):

$$\text{a) } \sqrt{16x^2} \quad \text{b) } \sqrt{18} + \sqrt{32} \quad \text{c) } \frac{x \left( \frac{1}{\sqrt{x}} - x\sqrt{x} \right)^2}{(1-x)^2}$$

$$\text{d) } \sqrt{16x-16} + 2\sqrt{x-1} - 3\sqrt{4x-4} \quad \text{e) } \sqrt{a^2 + b^2}$$

12. Evaluate:

$$\text{a) } 9 \left( \frac{81}{256} \right)^{-\frac{3}{4}} + 16 \left( -\frac{1}{8} \right)^{-\frac{1}{3}} (-2)^0 \quad \text{b) } \sqrt{(-256)^2}$$

13. Find all values of  $y$  such that  $\frac{4y^3 + 12y^2}{y} = 0$ .

14. The price for a product is dependent upon the demand for that product. Suppose the demand for the product is  $x$  (in hundreds of units), then the price is  $p = \frac{50x^2 - 100}{x^2 + 20x}$  (in

hundreds of dollars). The cost is the fixed cost \$2000 plus \$30 per unit.

- Write the expression for the revenue and simplify.
- Write the expression for the cost.
- Find the revenue, cost and profit if the demand is 80.

15. Use the Binomial Theorem to write out each binomial expansion:

$$\text{a) } (a^2 + 2)^5 \quad \text{b) } (2x - 3y)^3$$

16. Perform the indicated operations:

$$\text{a) } (a^3 - a + 1) - (-2a^3 + a^2 + 1) \quad \text{b) } (x^3 + 2x - 3)(x^2 - x + 1)$$

$$\text{c) } \frac{4x^4 + x^2 + 3x - 4}{2x + 1}$$