

# PROBLEMS ON PRE-CALCULUS ALGEBRA MTH112

## CHAPTER REVIEW

### Exercise 1.

Let  $A = \{x \in \mathbb{N} | x : 5\}$  and  $B = \{x \in \mathbb{N} | x : 3\}$ . Determine

- a)  $A \cap B$                       b)  $A \cup B$                       c)  $A \cup (A \cap B)$

**Exercise 2.** Let  $A = [-2; 4]$ ,  $B = (1; 5)$ ,  $C = [-3; 3]$  be three sets of the universal set  $X = [-5; 5]$ . Determine

- a)  $A \cup B$                       b)  $A \cap (B \cup C)$                       d)  $\bar{A}$   
 e)  $\bar{A} \cap (B \cup \bar{C})$                       f)  $\overline{A \cap B}$                       g)  $A \cup \overline{(B \cap C)}$

### Exercise 4.

In Problems 9–20, use  $U = \text{universal set} = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ ,  $A = \{1, 3, 4, 5, 9\}$ ,  $B = \{2, 4, 6, 7, 8\}$ , and  $C = \{1, 3, 4, 6\}$  to find each set.

- |   |                           |                           |                           |
|---|---------------------------|---------------------------|---------------------------|
| 9. $A \cup B$   | 10. $A \cup C$            | 11. $A \cap B$            | 12. $A \cap C$            |
|  13. $(A \cup B) \cap C$   | 14. $(A \cap B) \cup C$   | 15. $\bar{A}$             | 16. $\bar{C}$             |
|  17. $\overline{A \cap B}$ | 18. $\overline{B \cup C}$ | 19. $\overline{A \cup B}$ | 20. $\overline{B \cap C}$ |

### Exercise 5.


In Problems 65–68, determine the domain of the variable  $x$  in each expression.

65.  $\frac{4}{x-5}$                       66.  $\frac{-6}{x+4}$                       67.  $\frac{x}{x+4}$                       68.  $\frac{x-2}{x-6}$

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### Exercise 6.

In Problems 89–104, find the quotient and the remainder. Check your work by verifying that  
 (Quotient)(Divisor) + Remainder = Dividend

- |  |  |
|--|--|
| 89. $4x^3 - 3x^2 + x + 1$ divided by $x + 2$   | 90. $3x^3 - x^2 + x - 2$ divided by $x + 2$        |
| 91. $4x^3 - 3x^2 + x + 1$ divided by $x^2$   | 92. $3x^3 - x^2 + x - 2$ divided by $x^2$          |
|  93. $5x^4 - 3x^2 + x + 1$ divided by $x^2 + 2$ | 94. $5x^4 - x^2 + x - 2$ divided by $x^2 + 2$      |
| 95. $4x^5 - 3x^2 + x + 1$ divided by $2x^3 - 1$  | 96. $3x^5 - x^2 + x - 2$ divided by $3x^3 - 1$     |
| 97. $2x^4 - 3x^3 + x + 1$ divided by $2x^2 + x + 1$  | 98. $3x^4 - x^3 + x - 2$ divided by $3x^2 + x + 1$ |
| 99. $-4x^3 + x^2 - 4$ divided by $x - 1$   | 100. $-3x^4 - 2x - 1$ divided by $x - 1$           |
| 101. $1 - x^2 + x^4$ divided by $x^2 + x + 1$  | 102. $1 - x^2 + x^4$ divided by $x^2 - x + 1$      |
| 103. $x^3 - a^3$ divided by $x - a$  | 104. $x^5 - a^5$ divided by $x - a$                |

## Exercise 7.

In Problems 75–122, factor completely each polynomial. If the polynomial cannot be factored, say it is prime.

- |                                     |                                   |                             |                         |
|-------------------------------------|-----------------------------------|-----------------------------|-------------------------|
| 75. $x^2 - 36$                      | 76. $x^2 - 9$                     | 77. $2 - 8x^2$              | 78. $3 - 27x^2$         |
| 79. $x^2 + 11x + 10$                | 80. $x^2 + 5x + 4$                | 81. $x^2 - 10x + 21$        | 82. $x^2 - 6x + 8$      |
| 83. $4x^2 - 8x + 32$                | 84. $3x^2 - 12x + 15$             | 85. $x^2 + 4x + 16$         | 86. $x^2 + 12x + 36$    |
| 87. $15 + 2x - x^2$                 | 88. $14 + 6x - x^2$               | 89. $3x^2 - 12x - 36$       | 90. $x^3 + 8x^2 - 20x$  |
| 91. $y^4 + 11y^3 + 30y^2$           | 92. $3y^3 - 18y^2 - 48y$          | 93. $4x^2 + 12x + 9$        | 94. $9x^2 - 12x + 4$    |
| 95. $6x^2 + 8x + 2$                 | 96. $8x^2 + 6x - 2$               | 97. $x^4 - 81$              | 98. $x^4 - 1$           |
| 99. $x^6 - 2x^3 + 1$                | 100. $x^6 + 2x^3 + 1$             | 101. $x^7 - x^5$            | 102. $x^8 - x^5$        |
| 103. $16x^2 + 24x + 9$              | 104. $9x^2 - 24x + 16$            | 105. $5 + 16x - 16x^2$      | 106. $5 + 11x - 16x^2$  |
| 107. $4y^2 - 16y + 15$              | 108. $9y^2 + 9y - 4$              | 109. $1 - 8x^2 - 9x^4$      | 110. $4 - 14x^2 - 8x^4$ |
| 111. $x(x + 3) - 6(x + 3)$          | 112. $5(3x - 7) + x(3x - 7)$      | 113. $(x + 2)^2 - 5(x + 2)$ |                         |
| 114. $(x - 1)^2 - 2(x - 1)$         | 115. $(3x - 2)^3 - 27$            | 116. $(5x + 1)^3 - 1$       |                         |
| 117. $3(x^2 + 10x + 25) - 4(x + 5)$ | 118. $7(x^2 - 6x + 9) + 5(x - 3)$ | 119. $x^3 + 2x^2 - x - 2$   |                         |
| 120. $x^3 - 3x^2 - x + 3$           | 121. $x^4 - x^3 + x - 1$          | 122. $x^4 + x^3 + x + 1$    |                         |

## Exercise 8.

In Problems 123–132, expressions that occur in calculus are given. Factor completely each expression.

- |   |   |
|---|---|
| 123. $2(3x + 4)^2 + (2x + 3) \cdot 2(3x + 4) \cdot 3$                     | 124. $5(2x + 1)^2 + (5x - 6) \cdot 2(2x + 1) \cdot 2$                     |
| 125. $2x(2x + 5) + x^2 \cdot 2$   | 126. $3x^2(8x - 3) + x^3 \cdot 8$   |
| 127. $2(x + 3)(x - 2)^3 + (x + 3)^2 \cdot 3(x - 2)^2$                     | 128. $4(x + 5)^3(x - 1)^2 + (x + 5)^4 \cdot 2(x - 1)$                     |
| 129. $(4x - 3)^2 + x \cdot 2(4x - 3) \cdot 4$                             | 130. $3x^2(3x + 4)^2 + x^3 \cdot 2(3x + 4) \cdot 3$                       |
| 131. $2(3x - 5) \cdot 3(2x + 1)^3 + (3x - 5)^2 \cdot 3(2x + 1)^2 \cdot 2$ | 132. $3(4x + 5)^2 \cdot 4(5x + 1)^2 + (4x + 5)^3 \cdot 2(5x + 1) \cdot 5$ |
| 133. Show that $x^2 + 4$ is prime.  | 134. Show that $x^2 + x + 1$ is prime.                                    |

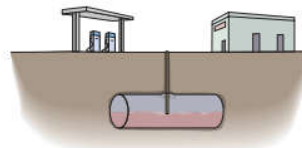
## Exercise 9.

- 107. Calculating the Amount of Gasoline in a Tank** A Shell station stores its gasoline in underground tanks that are right circular cylinders lying on their sides. See the illustration. The volume  $V$  of gasoline in the tank (in gallons) is given by the formula

$$V = 40h^2 \sqrt{\frac{96}{h} - 0.608}$$

where  $h$  is the height of the gasoline (in inches) as measured on a depth stick.

- (a) If  $h = 12$  inches, how many gallons of gasoline are in the tank?  
 (b) If  $h = 1$  inch, how many gallons of gasoline are in the tank?



## HOMEWORKS:

Exercise 4: 17-20,

Exercise 7: 100-102

Exercise 9