

## HW: Factoring Polynomials

**I. In Problems 1-5, use the Remainder Theorem to determine the remainder when the polynomial is divided by the given binomial.**

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|-----|---|------------|-----------|
| 1.) | $p(x) = 7x^{49} - 5x^{13} + 3x^2 - 5$ ;         | Divided by | $(x + 1)$ |
| 2.) | $p(x) = x^{50} - x^{10} - x^2 - 1$ ;            | Divided by | $(x + 1)$ |
| 3.) | $p(x) = 18x^{22} - 5x^{17} + 4x^3 - 8x^2 + 1$ ; | Divided by | $(x - 1)$ |
| 4.) | $p(x) = 8x^5 - x^4 - x^3 - x^2 - 3x + 1$ ;      | Divided by | $(x + 2)$ |
| 5.) | $p(x) = 3x^4 - x^2 - 8x + 2$ ;                  | Divided by | $(x - 3)$ |

**II. In Problems 6-11, use the Factor Theorem to determine if the given item is a factor of the function.**

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|------|--|---------|-----------|
| 6.)  | $f(x) = 3x^4 - 20x^3 + 41x^2 - 20x - 12$ ; | Factor? | $(x - 2)$ |
| 7.)  | $g(x) = x^{50} - 1$ ;                      | Factor? | $(x + 1)$ |
| 8.)  | $f(x) = x^{48} - 2$ ;                      | Factor? | $(x - 1)$ |
| 9.)  | $g(x) = x^5 - 5x^4 - 81x + 405$ ;          | Factor? | $(x - 5)$ |
| 10.) | $f(x) = x^{11} - x^3 + 1$ ;                | Factor? | $(x + 1)$ |
| 11.) | $g(x) = 9x^3 - 3x^2 + x + 1$ ;             | Factor? | $(x + 2)$ |

**III. In Problems 12-15, use the Rational Zeros Theorem to state the possible Rational Zeros.**

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| 12.) | $f(x) = 3x^4 - 20x^3 + 41x^2 - 20x - 12$ |
| 13.) | $g(x) = 2x^3 - 2x + 8$                   |
| 14.) | $f(x) = 6x^3 - 2x^2 + 3x - 1$            |
| 15.) | $g(x) = 8x^2 + 2x - 15$                  |

**IV. In Problems 16-18, solve for the variable(s) as requested. (Using the Factor Theorem could help!)**

- 16.) Find the value of  $k$  such that  $(x - 2)$  must be a factor of  $p(x) = 3x^3 - 4x^2 + kx + 2$  .
- 17.) Find the value of  $k$  such that  $(x + 1)$  must be a factor of  $p(x) = x^3 + kx^2 - 5x - 3$  .
- 18.) Find values of  $A$  and  $B$  such that  $(x - 1)$  and  $(x + 3)$  must both be factors of  $p(x) = 4x^3 + Ax^2 + Bx - 3$  . (You might want to have a system to solve this!)

**V. In Problems 19-20, factor the polynomial completely.**

- 19.)  $f(x) = x^3 - 10x^2 + 17x + 28$
- 20.)  $f(x) = 6x^4 + 5x^3 - 23x^2 - 20x - 4$