

The Remainder and Factor Theorems

Use synthetic substitution to find $f(-3)$ and $f(4)$ for each function.

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| 1. $f(x) = x^2 + 2x + 3$ | 2. $f(x) = x^2 - 5x + 10$ |
| 3. $f(x) = x^2 - 5x - 4$ | 4. $f(x) = x^3 - x^2 - 2x + 3$ |
| 5. $f(x) = x^3 + 2x^2 + 5$ | 6. $f(x) = x^3 - 6x^2 + 2x$ |
| 7. $f(x) = x^3 - 2x^2 - 2x + 8$ | 8. $f(x) = x^3 - x^2 + 4x - 4$ |
| 9. $f(x) = x^3 + 3x^2 + 2x - 50$ | 10. $f(x) = x^4 + x^3 - 3x^2 - x + 12$ |
| 11. $f(x) = x^4 - 2x^2 - x + 7$ | 12. $f(x) = 2x^4 - 3x^3 + 4x^2 - 2x + 1$ |
| 13. $f(x) = 2x^4 - x^3 + 2x^2 - 26$ | 14. $f(x) = 3x^4 - 4x^3 + 3x^2 - 5x - 3$ |
| 15. $f(x) = x^5 + 7x^3 - 4x - 10$ | 16. $f(x) = x^6 + 2x^5 - x^4 + x^3 - 9x^2 + 20$ |

Given a polynomial and one of its factors, find the remaining factors of the polynomial. Some factors may not be binomials.

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| 17. $x^3 + 3x^2 - 6x - 8; x - 2$ | 18. $x^3 + 7x^2 + 7x - 15; x - 1$ |
| 19. $x^3 - 9x^2 + 27x - 27; x - 3$ | 20. $x^3 - x^2 - 8x + 12; x + 3$ |
| 21. $x^3 + 5x^2 - 2x - 24; x - 2$ | 22. $x^3 - x^2 - 14x + 24; x + 4$ |
| 23. $3x^3 - 4x^2 - 17x + 6; x + 2$ | 24. $4x^3 - 12x^2 - x + 3; x - 3$ |
| 25. $18x^3 + 9x^2 - 2x - 1; 2x + 1$ | 26. $6x^3 + 5x^2 - 3x - 2; 3x - 2$ |
| 27. $x^5 + x^4 - 5x^3 - 5x^2 + 4x + 4; x + 1$ | 28. $x^5 - 2x^4 + 4x^3 - 8x^2 - 5x + 10; x - 2$ |

29. **POPULATION** The projected population in thousands for a city over the next several years can be estimated by the function $P(x) = x^3 + 2x^2 - 8x + 520$, where x is the number of years since 2005. Use synthetic substitution to estimate the population for 2010.

30. **VOLUME** The volume of water in a rectangular swimming pool can be modeled by the polynomial $2x^3 - 9x^2 + 7x + 6$. If the depth of the pool is given by the polynomial $2x + 1$, what polynomials express the length and width of the pool?