
You can use the process of synthetic division/substitution for the following uses:

- dividing polynomials by a linear binomial ... answer is a full quotient + remainder
 - evaluating a polynomial function ... answer is the value of the remainder
 - factoring a polynomial function ... answer is a group of factors
 - finding roots/zeros of a polynomial function ... answer is a solution set for "x"
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Divide using synthetic division:

1. $(x^2 + 10) \div (x + 4)$

2. $(x^3 - 14x + 8) \div (x + 4)$

3. $(2x^4 - 6x^3 + x^2 - 3x - 3) \div (x - 3)$

4. $(x^3 - 8) \div (x - 2)$

Evaluate each function using synthetic substitution.

5. $f(x) = 2x^3 - 3x^2 + 4x + 2$; $f(3)$

6. $f(x) = 2x^4 + 9x^3 + 4x^2 - 8x + 10$; $f(-3)$

7. $f(x) = x^3 + 8x^2 + 8x - 32$; $f(-4)$

8. $f(x) = x^4 + 2x^3 - 63x^2 - 288x - 324$; $f(-4)$

9. $f(x) = x^3 + 2x^2 - 5x - 6$; $f(1)$

10. $f(x) = 12x^4 - 29x^3 - 60x^2 + 107x + 50$; $f(-2)$

Factor each polynomial function, using the given information.

11. $f(x) = x^3 - 8x^2 + 5x + 14$; $f(2) = 0$

12. $f(x) = 12x^3 + 8x^2 - 13x + 3$; $x = \frac{1}{2}$ is one zero

13. $f(x) = x^3 + 3x^2 - 34x + 48$; $(x - 3)$ is a factor

14. $f(x) = x^4 + 6x^3 - 4x^2 - 54x - 45$; $f(-5) = 0$

15. $f(x) = 2x^4 - 9x^3 + 4x^2 + 21x - 18$; $x = 2$ and $x = 3$ are roots

Find the zeros of each function, using the given information.

16. $f(x) = x^3 + 2x^2 - 20x + 24$; $(x + 6)$ is a factor

17. $f(x) = 2x^3 + 3x^2 - 3x - 2$; $f(-2) = 0$

18. $f(x) = 2x^3 + 11x^2 + 9x + 2$; $(2x + 1)$ is a factor

19. $f(x) = x^4 + 2x^3 - 14x^2 - 32x - 32$; ± 4 are zeros

20. $f(x) = x^4 + 3x^3 + 7x^2 + 15x + 10$; $(x + 2)$ is a factor.

**** Challenge:**

$f(x) = 3x^4 - 2x^3 - 12x^2 + 6x + 9$; $\pm\sqrt{3}$ are roots