

CHECKING ZEROS Decide whether the given x -value is a zero of the function.

15. $f(x) = x^3 - x^2 + 4x - 4, x = 1$ **yes** 16. $f(x) = x^3 + 3x^2 - 5x + 8, x = 4$ **no**
 17. $f(x) = x^4 - x^2 - 3x + 3, x = 0$ **no** 18. $f(x) = x^3 + 5x^2 + x + 5, x = -5$ **yes**
 19. $f(x) = x^3 - 4x^2 + 16x - 64, x = 4i$ **yes** 20. $f(x) = x^3 - 3x^2 + x - 3, x = -i$ **yes**

FINDING ZEROS Find all the zeros of the polynomial function.

21. $f(x) = x^4 + 5x^3 + 5x^2 - 5x - 6$
 $-3, -2, -1, 1$
 23. $f(x) = x^3 - 4x^2 + 3x$ **0, 1, 3**
 25. $f(x) = x^4 + 7x^3 - x^2 - 67x - 60$
 $-5, -4, -1, 3$
 27. $f(x) = x^3 - x^2 + 49x - 49$ **1, $\pm 7i$**
 29. $f(x) = x^4 + 6x^3 + 14x^2 + 54x + 45$
 $-5, -1, \pm 3i$
 31. $f(x) = x^4 - x^3 - 5x^2 - x - 6$
 $-2, 3, \pm i$
 33. $f(x) = 2x^4 - 7x^3 - 27x^2 + 63x + 81$ **See margin.**
 22. $f(x) = x^4 + 4x^3 - 6x^2 - 36x - 27$
 $-3, -3, -1, 3$
 24. $f(x) = x^3 + 5x^2 - 4x - 20$ **$-5, -2, 2$**
 26. $f(x) = x^4 - 5x^2 - 36$ **$\pm 3, \pm 2i$**
 28. $f(x) = x^3 - x^2 + 25x - 25$ **1, $\pm 5i$**
 30. $f(x) = x^3 + 3x^2 + 25x + 75$
 $-3, \pm 5i$
 32. $f(x) = x^4 + x^3 + 2x^2 + 4x - 8$
 $-2, 1, \pm 2i$
 34. $f(x) = 2x^4 - x^3 - 42x^2 + 16x + 160$ **See margin.**

cause the graph inter-
 $S = 2000$ when t is
when t is about 6.3.

$$35. f(x) = x^3 - 7x^2 + 14x - 8$$

$$36. f(x) = x^3 - 2x^2 - 19x + 20$$

$$37. f(x) = x^3 - 2x^2 - 33x + 90$$

$$38. f(x) = x^3 + 5x^2 - 4x - 20$$

$$39. f(x) = x^3 + 13x^2 + 50x + 56$$

$$40. f(x) = x^3 - 8x^2 + x - 8$$

$$41. f(x) = x^3 - 5x^2 + 9x - 45$$

$$42. f(x) = x^4 + 32x^2 - 144$$

$$43. f(x) = x^4 + 10x^2 + 9$$

$$44. f(x) = x^4 - 6x^3 + 35x^2 - 150x + 250$$

$$45. f(x) = x^4 - 12x^3 + 53x^2 - 104x + 80$$


$$46. f(x) = x^5 + x^4 + 8x^3 + 4x^2 - 128x - 192$$

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