

Solve the following polynomial equations.

(1) $x^3 + 6x^2 - x - 30 = 0$, $x = -5, x = -3, x = 2$

(2) $x^4 + 3x^3 - 16x^2 + 19x - 7 = 0$ $x = 1$ double, $x = \frac{-5 \pm \sqrt{53}}{2}$

(3) $x^3 + 9x^2 + 27x + 27 = 0$, $x = -3$ triple

(4) $x^4 + x^3 - 7x^2 - x + 6 = 0$ $x = -3, x = -1, x = 1, x = 2$

(5) $x^4 + x^3 - 11x^2 + 9x - 180 = 0$ $x = -3i, x = 3i, x = -5, x = 4$

(6) $x^5 - x^4 - 5x^3 + x^2 + 8x + 4 = 0$, $x = -1$ triple, $x = 2$ double

(7) $x^4 - 7x^3 + 13x^2 + 3x - 18 = 0$, $x = -1, x = 2, x = 3$ double

(8) $x^8 - 2x^7 - 9x^6 + 12x^5 + 27x^4 - 18x^3 - 31x^2 + 8x + 12 = 0$
 $x = -2, x = -1$ triple, $x = 1$ double, $x = 2, x = 3$

(9) $6x^3 + 41x^2 - 8x - 7 = 0$ $x = -7, x = -\frac{1}{3}, x = \frac{1}{2}$

(10) $10x^4 + 29x^3 - 15x^2 - 5x + 2 = 0$ $x = -\frac{2}{5}, x = \frac{1}{2}, x = \frac{-3 \pm \sqrt{13}}{2}$

(11) $12x^4 + 92x^3 + 43x^2 - 88x + 21 = 0$

$x = -7, x = -\frac{3}{2}, x = \frac{1}{2}, x = \frac{1}{3}$

(12) $10x^6 - 19x^5 + 6x^4 - 10x^2 + 19x - 6 = 0$

$x = -1, x = -i, x = i, x = 1, x = \frac{3}{2}, x = \frac{2}{5}$