

Factoring Cubic Functions

Name:

Factor each completely.

Hour:

1) $x^3 + 125$

$$(x+5)(x^2 - 5x + 25)$$

2) $a^3 + 64$

$$(a+4)(a^2 - 4a + 16)$$

3) $x^3 - 64$

$$(x-4)(x^2 + 4x + 16)$$

4) $u^3 + 8$

$$(u+2)(u^2 - 2u + 4)$$

5) $x^3 - 27$

$$(x-3)(x^2 + 3x + 9)$$

6) $125 - x^3$

$$(5-x)(25 + 5x + x^2)$$

7) $1 - a^3$

$$(1-a)(1+a+a^2)$$

8) $a^3 + 125$

$$(a+5)(a^2 - 5a + 25)$$

9) $x^3 + 27$

$$(x+3)(x^2 - 3x + 9)$$

10) $x^3 + 1$

$$(x+1)(x^2 - x + 1)$$

11) $8x^3 + 27$

$$(2x+3)(4x^2 - 6x + 9)$$

12) $-27u^3 + 125$

$$a = -3u \quad (-3u+5)(9u^2 - (-15u) + 25)$$

$$b = 5$$

$$\boxed{(-3u+5)(9u^2 + 15u + 25)}$$

Solve each cubic polynomial

1) $x^3 + 125$

$x + 5 = 0 \rightarrow \boxed{x = -5}$

$x^2 - 5x + 25 = 0$

$x = \frac{5 \pm \sqrt{25 - 4(1)(25)}}{2(1)} = \frac{5 \pm \sqrt{-75}}{2}$

$x = \frac{5 \pm 5i\sqrt{3}}{2}$

2) $a^3 + 64$

$a + 4 = 0 \rightarrow \boxed{a = -4}$

$a^2 - 4a + 16 = 0$

$x = \frac{4 \pm \sqrt{16 - 4(1)(16)}}{2(1)} = \frac{4 \pm 4i\sqrt{3}}{2}$

$x = 2 \pm 2i\sqrt{3}$

$x = 4 \pm$

3) $x^3 - 64$

$x - 4 = 0 \rightarrow \boxed{x = 4}$

$x^2 + 4x + 16 = 0$

$x = \frac{-4 \pm \sqrt{-48}}{2} = \frac{-4 \pm 4i\sqrt{3}}{2}$

$x = \frac{-4 \pm \sqrt{16 - 4(1)(16)}}{2} \rightarrow \boxed{x = -2 \pm 2i\sqrt{3}}$

4) $u^3 + 8$

$u + 2 = 0 \rightarrow \boxed{u = -2}$

$u^2 + 2u + 4 = 0$

$x = \frac{2 \pm \sqrt{4 - 4(1)(4)}}{2(1)} \rightarrow x = \frac{2 \pm 2i\sqrt{3}}{2}$

$x = 1 \pm i\sqrt{3}$

$x = \frac{2 \pm \sqrt{-12}}{2}$

5) $x^3 - 27$

$x - 3 = 0 \rightarrow \boxed{x = 3}$

$x^2 + 3x + 9 = 0$

$x = \frac{-3 \pm \sqrt{9 - 4(1)(9)}}{2(1)}$

$x = \frac{-3 \pm \sqrt{-27}}{2}$

$x = \frac{-3 \pm 3i\sqrt{3}}{2}$

6) $125 - x^3$

$5 - x = 0 \rightarrow \boxed{x = 5}$

$25 + 5x + x^2 = 0$

$x = \frac{-5 \pm \sqrt{25 - 4(1)(25)}}{2(1)}$

$x = \frac{-5 \pm 5i\sqrt{3}}{2}$

8) $a^3 + 125$

$a + 5 = 0 \rightarrow \boxed{a = -5}$

$a^2 + 5a + 25 = 0$

$x = \frac{5 \pm \sqrt{25 - 4(1)(25)}}{2(1)}$

$x = \frac{5 \pm 5i\sqrt{3}}{2}$

$x = \frac{5 \pm \sqrt{-75}}{2}$

7) $1 - a^3$

$(1 - a) = 0 \rightarrow \boxed{a = 1}$

$1 + a + a^2 = 0$

$x = \frac{-1 \pm \sqrt{1^2 - 4(1)(1)}}{2(1)}$

$x = \frac{-1 \pm \sqrt{-3}}{2}$

$x = \frac{-1 \pm \sqrt{1 - 4}}{2}$

$x = \frac{-1 \pm i\sqrt{3}}{2}$

9) $x^3 + 27$

$x + 3 = 0 \rightarrow \boxed{x = -3}$

$x^2 - 3x + 9 = 0$

$x = \frac{3 \pm \sqrt{9 - 4(1)(9)}}{2(1)}$

$x = \frac{3 \pm \sqrt{-27}}{2}$

$x = \frac{3 \pm 3i\sqrt{3}}{2}$

10) $x^3 + 1$

$x + 1 = 0 \rightarrow \boxed{x = -1}$

$x^2 - x + 1 = 0$

$x = \frac{-(-1) \pm \sqrt{1^2 - 4(1)(1)}}{2(1)}$

$x = \frac{1 \pm i\sqrt{3}}{2}$

11) $8x^3 + 27$

$2x + 3 = 0 \rightarrow \boxed{x = -\frac{3}{2}}$

$4x^2 - 6x + 9 = 0$

$x = \frac{6 \pm \sqrt{36 - 4(4)(9)}}{2(4)}$

$x = \frac{6 \pm 6i\sqrt{3}}{8}$

$x = \frac{3 \pm 3i\sqrt{3}}{4}$

12) $-27u^3 + 125$

$-3u + 5 = 0 \rightarrow \boxed{x = -\frac{5}{3} = \frac{5}{3}}$

$9u^2 + 15u + 25 = 0$

$x = \frac{-15 \pm \sqrt{225 - 4(9)(25)}}{2(9)} = \frac{15 \pm 15i\sqrt{3}}{18} = \frac{5 \pm 5i\sqrt{3}}{6}$