$x^2 + 4 = 0$

$x^2 = -4$

$x = \pm\sqrt{-4}$ ← no solution, but really there is a solution – it's just imaginary!

Imaginary Numbers

KP

Introduction to section 5.5

$i = \sqrt{-1}$

1. $i^0 =$ 1
2. $i^1 =$ i
3. $i^2 =$ -1 — $\sqrt{-1}\cdot\sqrt{-1} = -1$
4. $i^3 =$ $-i$ — $i \cdot i^2 = i \cdot -1$
5. $i^4 =$ 1 — $i^2 \cdot i^2 = -1 \cdot -1$
6. $i^5 =$ i
7. $i^6 =$ -1
8. $i^7 =$ $-i$
9. $i^8 =$ 1
10. $i^9 =$ i
11. $i^{10} =$ -1
12. $i^{11} =$ $-i$
13. $i^{12} =$ 1
14. $i^{13} =$ i
15. $i^{14} =$ -1

Patterns of Imaginary Numbers

Divide the exponent by 4

The remainder determines the answer!

If the remainder is:

0 → then = 1

.25 → then = i

.5 → then = -1

.75 → then = $-i$

Use the pattern to solve #16-21:

16. $i^{47} =$ $-i$ — 11.75
17. $i^{54} =$ -1 — 13.5
18. $i^{100} =$ 1 — 25
19. $i^{115} =$ $-i$ — 28.75
20. $i^{1300} =$ 1 — 325
21. $i^{123456789} =$ i — 30864197.25