



# Imaginary Numbers



Introduction to section 5.5

$$1. i = \sqrt{-1}$$

$$2. i^1 = \sqrt{-1}$$

$$3. i^2 = -1$$

$$4. i^3 = -i$$

$$5. i^4 = 1$$

$$6. i^5 = i$$

$$7. i^6 = -1$$

$$8. i^7 = -i$$

$$9. i^8 = 1$$

$$10. i^9 = i$$

$$11. i^{10} = -1$$

$$12. i^{11} = -i$$

$$13. i^{12} = 1$$

$$14. i^{20} = 1 \quad 20 \div 4 = 5 \text{ R } 0$$

$$15. i^{33} = i \text{ R } 1$$

## Patterns of Imaginary Numbers

- Divide the exponent by 4
- The remainder determines the answer
- If the remainder is...
  - 0 then = 1
  - 1 (.25) then = i
  - 2 (.50) then = -1
  - 3 (.75) then = -i

$$16. i^{47} = -i \text{ R } 3$$

$$16. i^{54} = -1 \text{ R } 2$$

$$17. i^{100} = 1 \text{ R } 0$$

$$18. i^{115} = -i \text{ R } 3$$

$$19. i^{1300} = 1 \text{ R } 0$$

$$20. i^{123456789} = i \text{ R } 1$$