

Math 193: Complex Number Exercises

Recall that for complex numbers, $i = \sqrt{-1}$.

So

$$\begin{aligned}\sqrt{-4} &= \sqrt{4}\sqrt{-1} \\ &= 2i\end{aligned}$$

and

$$\begin{aligned}\sqrt{-7} &= \sqrt{7}\sqrt{-1} \\ &= i\sqrt{7}\end{aligned}$$

Exercises:

Simplify.

1. $\sqrt{-49}$

5. $\sqrt{-12}$

2. $\sqrt{-9}$

6. $\sqrt{-18}$

3. $\sqrt{-25}$

7. $\sqrt{-8}$

4. $\sqrt{-100}$

8. $\sqrt{-28}$

And this can be used to solve, for example,

$$\begin{aligned}m^2 + 9 &= 0 \\ m^2 &= -9 \\ m &= \pm\sqrt{-9} \\ m &= \pm 3i\end{aligned}$$

Exercises:

Solve.

9. $m^2 + 25 = 0$

11. $m^2 + 6 = 0$

10. $m^2 + 49 = 0$

12. $m^2 + 20 = 0$

So, for example, to solve $m^2 + 4m + 5 = 0$, use the quadratic formula:

$$\begin{aligned} m &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-4 \pm \sqrt{4^2 - 4(5)}}{2(1)} \\ &= \frac{-4 \pm \sqrt{16 - 20}}{2} \\ &= \frac{-4 \pm \sqrt{-4}}{2} \\ &= \frac{-4 \pm 2i}{2} \\ &= -2 \pm i \end{aligned}$$

Exercises:

Solve. Give exact answers.

13. $m^2 - 4m + 13 = 0$

17. $4m^2 + 4m + 5 = 0$

14. $m^2 + 8m + 17 = 0$

18. $m^2 - 2m + 50 = 0$

15. $m^2 + 10m + 34 = 0$

19. $m^2 + 14m + 53 = 0$

16. $m^2 + 2m + 10 = 0$

20. $m^2 + 4m + 6 = 0$

Answers:

1. $\sqrt{-49} = 7i$

8. $\sqrt{-28} = 2i\sqrt{7}$

15. $m = -5 \pm 3i$

2. $\sqrt{-9} = 3i$

9. $m = \pm 5i$

16. $m = -1 \pm 3i$

3. $\sqrt{-25} = 5i$

10. $m = \pm 7i$

17. $m = -1/2 \pm i$

4. $\sqrt{-100} = 10i$

11. $m = \pm i\sqrt{6}$

18. $m = 1 \pm 7i$

5. $\sqrt{-12} = 2i\sqrt{3}$

12. $m = \pm 2i\sqrt{5}$

19. $m = -7 \pm 2i$

6. $\sqrt{-18} = 3i\sqrt{2}$

13. $m = 2 \pm 3i$

20. $m = -2 \pm i\sqrt{2}$

7. $\sqrt{-8} = 2i\sqrt{2}$

14. $m = -4 \pm i$