

Directions: Express each number in terms of i .

1. $8\sqrt{-4}$
 $8 \cdot \sqrt{-1} \cdot 2 = 16i$

3. $6\sqrt{-12}$
 $6 \cdot \sqrt{-1} \cdot \sqrt{4} \cdot \sqrt{3}$
 $6 \cdot i \cdot 2 \cdot \sqrt{3} = 12i\sqrt{3}$

2. $-\frac{1}{3}\sqrt{-90}$
 $-\frac{1}{3} \cdot \sqrt{-1} \cdot \sqrt{9} \cdot \sqrt{10}$
 $-\frac{1}{3} \cdot i \cdot 3 \cdot \sqrt{10} = -i\sqrt{10}$

4. $\sqrt{-50}$
 $\sqrt{-1} \cdot \sqrt{25} \cdot \sqrt{2}$
 $i \cdot 5 \cdot \sqrt{2} = 5i\sqrt{2}$

Directions: Solve each equation.

5. $x^2 + 49 = 0$
 $-49 -49$
 $\sqrt{x^2} = \sqrt{-49}$
 $x = \pm \sqrt{-1} \cdot 7$
 $x = \pm i \cdot 7$ $x = \pm 7i$

6. $5x^2 = -80$
 $\frac{5x^2}{5} = \frac{-80}{5}$
 $\sqrt{x^2} = \sqrt{-16}$
 $x = \pm \sqrt{-1} \cdot 4$
 $x = \pm i \cdot 4$ $x = \pm 4i$

7. $2x^2 + 16 = 0$
 $-16 -16$
 $\frac{2x^2}{2} = \frac{-16}{2}$
 $\sqrt{x^2} = \sqrt{-8}$
 $x = \pm \sqrt{-1} \cdot \sqrt{4} \cdot \sqrt{2}$
 $\pm i \cdot 2 \cdot \sqrt{2}$ $x = \pm 2i\sqrt{2}$

8. $x^2 + 18 = -6x$
#1 $x^2 + 6x + 18 = 0$
 $a=1, b=6, c=18$
 $x = \frac{-6 \pm \sqrt{6^2 - 4 \cdot 1 \cdot 18}}{2 \cdot 1}$
 $x = \frac{-6 \pm \sqrt{36 - 72}}{2}$
 $x = \frac{-6 \pm \sqrt{-36}}{2}$
 $x = \frac{-6 \pm 6i}{2}$
 $x = -3 \pm 3i$ or ± 2
 $x^2 + 6x + 9 = -9$
 $\sqrt{(x+3)^2} = \sqrt{-9}$
 $x+3 = \pm 3i$
 $x = -3 \pm 3i$

Directions: Find the x and y values that make each equation true.

9. $9x + (y)i - 5 = -12i + 4$
 $+5 +5$
 $9x + (y)i = -12i + 9$
 $\frac{9x}{9} = \frac{9}{9}$ $x = 1$
 $\frac{(y)i}{1} = \frac{-12i}{1}$ $y = -12$

10. $5(x-1) + (3y)i = -15i - 20$
 $5x - 5 + (3y)i = -15i - 20$
 $+5 +5$
 $5x + (3y)i = -15i - 15$
 $\frac{5x}{5} = \frac{-15}{5}$ $x = -3$
 $\frac{3y}{3} = \frac{-15}{3}$ $y = -5$

Directions: Find each complex conjugate.

11. $i = -i$

12. $-\frac{\sqrt{32}}{2} - 2i$
 $= \frac{-\sqrt{32}}{2} + 2i$

13. $-2.5i + 1$
 $= 1 + 2.5i$

Directions: Find the zeros of each function.

14. $f(x) = x^2 + 2x + 3$

15. $f(x) = x^2 + 4x + 8$

#1
 $x^2 + 2x + 3 = 0$
 $a=1, b=2, c=3$
 $x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot 3}}{2 \cdot 1}$
 $x = \frac{-2 \pm \sqrt{-8}}{2}$
 $x = \frac{-2 \pm 2i\sqrt{2}}{2} \rightarrow x = -1 \pm i\sqrt{2}$

or

#2
 $x^2 + 2x = -3$
 $x^2 + 2x + (\frac{2}{2})^2 = -3 + (\frac{2}{2})^2$
 $x^2 + 2x + 1 = -2$
 $\sqrt{(x+1)^2} = \sqrt{-2}$
 $x+1 = \pm i\sqrt{2}$
 $x = -1 \pm i\sqrt{2}$

#1
 $0 = x^2 + 4x + 8$
 $a=1, b=4, c=8$
 $x = \frac{-4 \pm \sqrt{4^2 - 4 \cdot 1 \cdot 8}}{2 \cdot 1}$
 $x = \frac{-4 \pm \sqrt{-16}}{2}$
 $x = \frac{-4 \pm 4i}{2}$
 $x = -2 \pm 2i$

or

#2
 $x^2 + 4x = -8$
 $x^2 + 4x + (\frac{4}{2})^2 = -8 + (\frac{4}{2})^2$
 $x^2 + 4x + 4 = -8 + 4$
 $\sqrt{(x+2)^2} = \sqrt{-4}$
 $x+2 = \pm 2i$
 $x = -2 \pm 2i$

Directions: Graph each complex number.

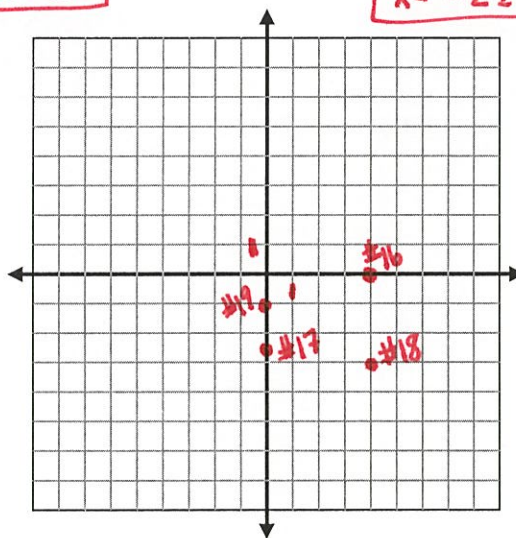
16. 4

17. $-2.5i$

18. $4 - 3i$

19. $-i$

$x + yi$



Directions: Find each absolute value. $|a + bi| = \sqrt{a^2 + b^2}$

20. $|2 + 3i|$

$a=2, b=3$

$\sqrt{2^2 + 3^2}$
 $\sqrt{4 + 9}$
 $\sqrt{13}$

21. $|-18|$

$a=18, b=0$

$\sqrt{18^2 + 0^2}$
 $\sqrt{324}$
 $= 18$

22. $|-0.5i|$

$a=0, b=-.5$

$\sqrt{0^2 + (-.5)^2}$
 $\sqrt{.25}$
 $= .5$

23. $|-1 + i|$

$a=-1, b=1$

$\sqrt{(-1)^2 + 1^2}$
 $\sqrt{1 + 1}$
 $\sqrt{2}$

Directions: Perform each indicated operation and write the result in the form $a + bi$.

24. $(-1 - 8i) + (4 + 3i)$

$$\underline{-1 - 8i + 4 + 3i}$$

$$\boxed{3 - 5i}$$

26. $(1 - 2i)(1 + 2i)$

$$1 + \cancel{2i} - \cancel{2i} - 4i^2$$

$$1 - 4i^2$$

$$1 - 4(-1)$$

$$1 + 4$$

$$\boxed{5}$$

28. $(-4 - 5i)(2 + 10i)$

$$\underline{-8 - 40i - 10i - 50i^2}$$

$$\underline{-8 - 50i - 50i^2}$$

$$\underline{-8 - 50i - 50(-1)}$$

$$\underline{-8 - 50i + 50}$$

$$\boxed{42 - 50i}$$

30. $2i^{15}$

3 - 4's in 15 = 1
3 left over
 $i^3 = -i$
 $2 \cdot 1 \cdot -i = \boxed{-2i}$

32. $\frac{45-3i}{7-8i} \cdot \frac{7+8i}{7+8i}$

$$\frac{315 + 360i - 21i - 24i^2}{49 + 56i - 56i - 64i^2}$$

$$\frac{315 + 339i - 24(-1)}{49 - 64(-1)}$$

$$\frac{315 + 339i + 24}{49 + 64}$$

$$\frac{339 + 339i}{113}$$

$$\boxed{3 + 3i}$$

25. $(-30 + i) - (-2 + 20i)$

$$\underline{-30 + i + 2 - 20i}$$

$$\boxed{-28 - 19i}$$

27. $3i(5 + 2i)$

$$15i + 6i^2$$

$$15i + 6(-1)$$

$$15i - 6$$

$$\boxed{-6 + 15i}$$

29. $-i^9$

2 - 4's in 9 = 1
1 left over
 $i^1 = i$
 $-1 \cdot i \cdot 1 = \boxed{-i}$

31. $\frac{5-4i}{i} \cdot \frac{-i}{-i}$

$$\frac{-5i + 4i^2}{-i^2}$$

$$\frac{-5i + 4(-1)}{-1(-1)}$$

$$\frac{-5i - 4}{1} \quad \boxed{-4 - 5i}$$

33. $\frac{-3-12i}{6i} \cdot \frac{-6i}{-6i}$

$$\frac{18i + 72i^2}{-36i^2}$$

$$\frac{18i + 72(-1)}{-36(-1)} \quad \boxed{-2 + \frac{1}{2}i}$$

$$\frac{18i - 72}{36} = \frac{1}{2}i - 2$$