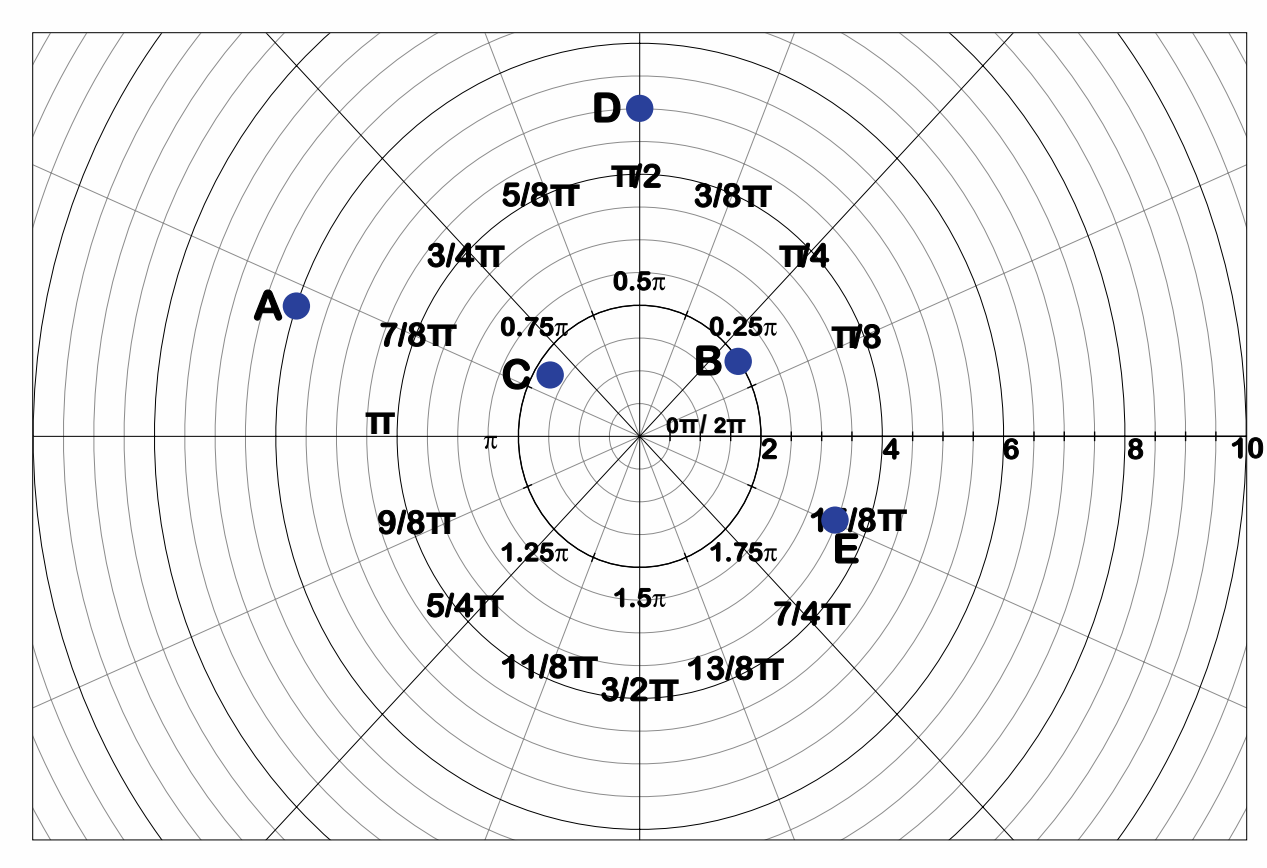
4.1 Polar Coordinates

Answers

1. Because a given point may have multiple descriptions

2. If $r < 0$, you extend to the left to measure distance. If $\theta > 360$, you circle around and continue.

3.-7. Picture of correctly graphed points below:

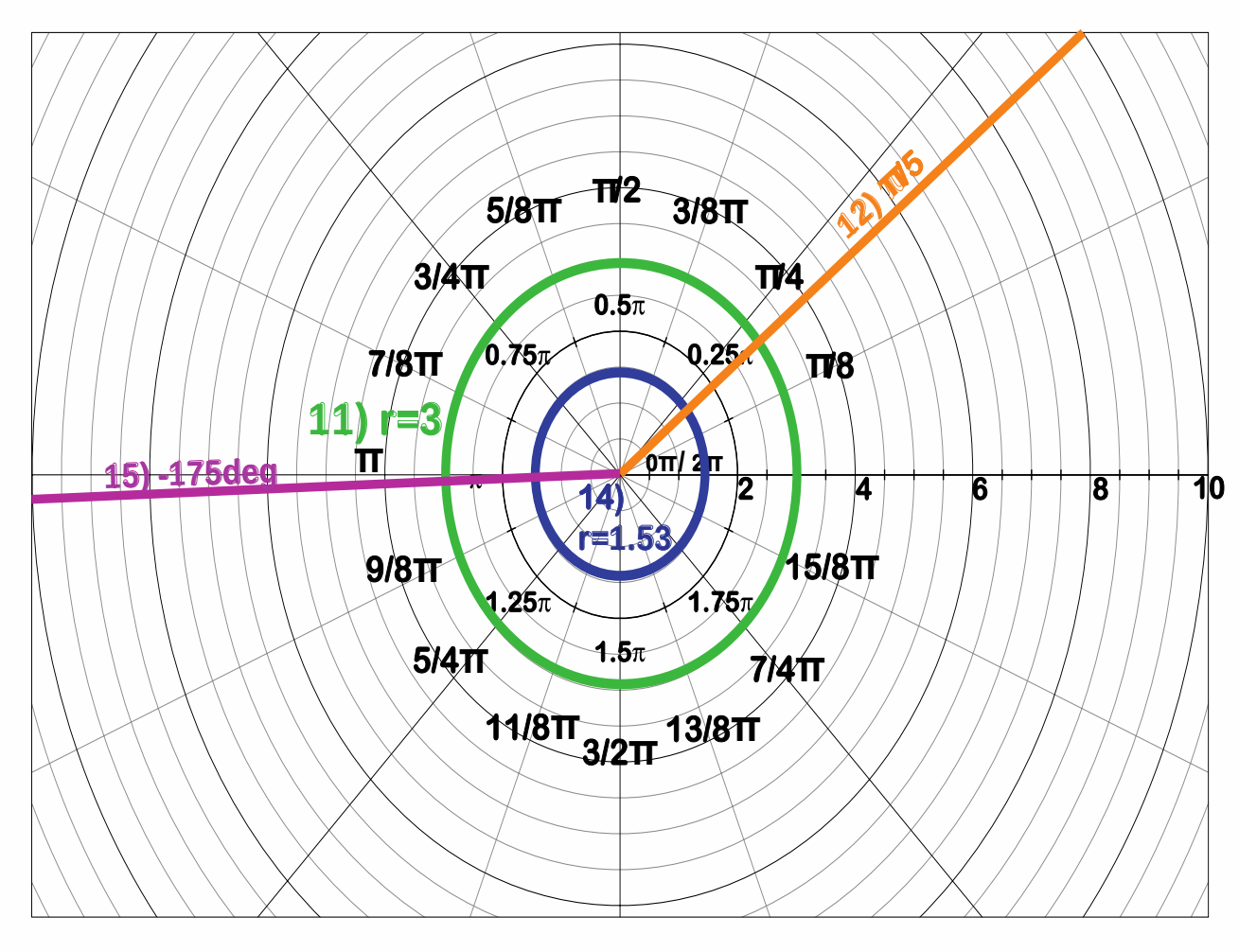


8. (-1.5, -190) and (1.5, .945pi)

9. (5, 5pi/3) and (-5, -60)

10. (-3, -55) and (3, 1.7pi)

11. – 15. Image below (NOTE: 13 is off the scale, should be a circle with a radius of 15.5)



1. Distance = 3.65 units

2. Distance = 13.21 units

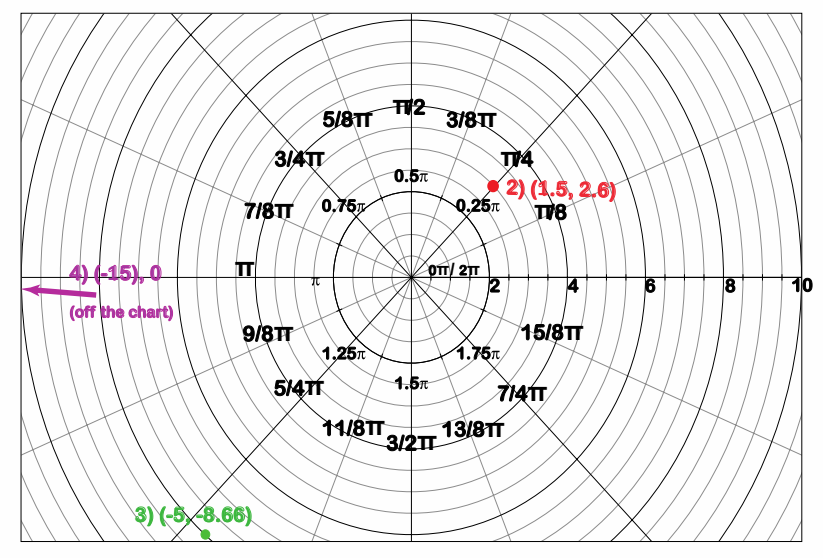
3. Distance = 9.87 units

4.2 Polar and Cartesian Transformation

Answers

1. (-5, 0)

2.-4. Points plotted in the image below:



5. (7.07, 5.5)

6. (10, 1.57)

7. (10, 2.5)

8. $y = .33x$

9. $x^2 + y^2 = 64$

10. $y = 7$

11. $x = -3$

12. $r = \sqrt{2}cosq$

13. $r\sin q = \sqrt{3}cosq \rightarrow r = \sqrt{3}\arctan q$

14. $q = \frac{3p}{2}$

15. $r\cos q \times r sinq = 15$

4.3 Systems of Polar Equations

Answers

1. They intersect twice

2. Once in the first and once in the fourth quadrant.

3. They intersect at: $(1, \frac{p}{3})$ and $(1, \frac{5p}{3})$

4. 3 points of intersection

5. Points of intersection are (0, 0), $(\frac{1}{2}, \frac{p}{2})$ and $(\frac{1}{2}, \frac{5p}{3})$

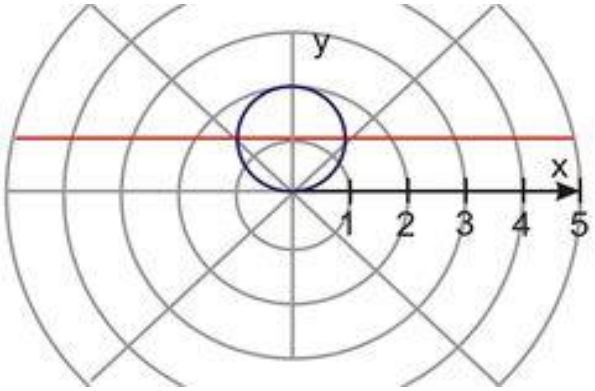
6. (2, 0)

7. (0, 0)

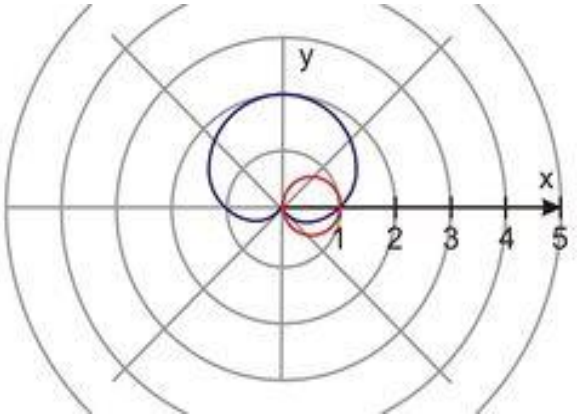
8. (0, 0), $(\frac{1}{\sqrt{2}}, \frac{p}{12})$, $(\frac{-1}{\sqrt{2}}, \frac{5p}{12})$, $(\frac{1}{\sqrt{2}}, \frac{3pi}{4})$

9. $(\frac{3}{2}, \frac{p}{3})$, $(\frac{3}{2}, \frac{5p}{3})$

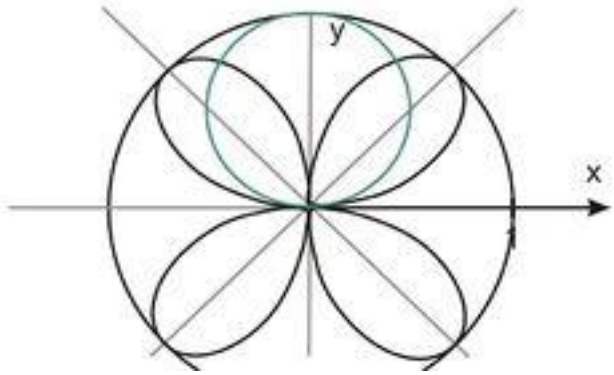
10. $\left(\sqrt{2}, \frac{\pi}{4}\right), \left(\sqrt{2}, \frac{3\pi}{4}\right)$



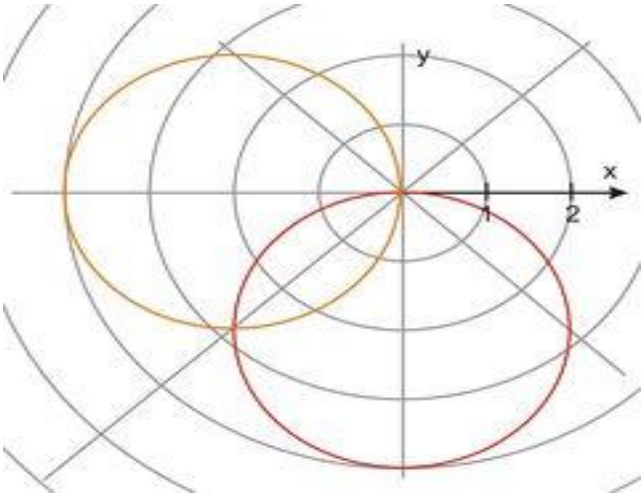
11. $(0,0), (1,0)$



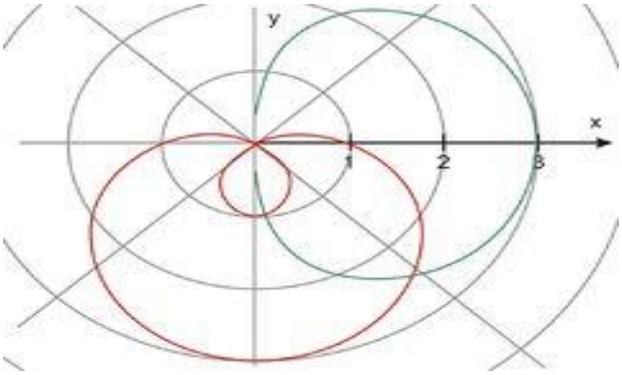
12. $(0,0), \left(\frac{\sqrt{3}}{2}, \frac{2\pi}{3}\right), \left(\frac{\sqrt{3}}{2}, \frac{\pi}{3}\right)$



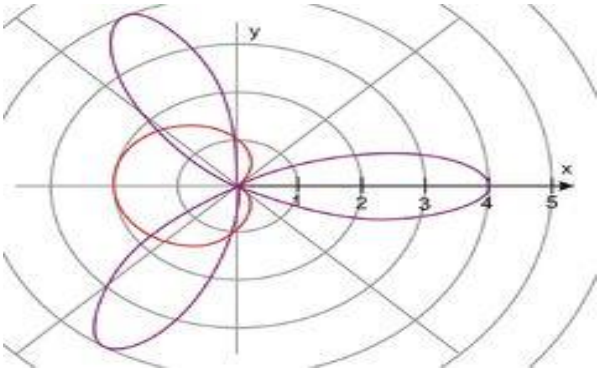
13. $(0,0), \left(2\sqrt{2}, \frac{5\pi}{4}\right)$



14. $(1, 276°), (2.44, 313°)$



15. $(0,0), (1.08, 95°), (1.77, 142°), (1.77, 218°), (1.08, 265°)$



4.4 Imaginary Numbers

Answers

1. $7i$

2. $9i$

3. $18i$

4. $11i$

5. $-4i$

6. $-i$

7. $1.1i$

8. 1

9. 1

10. $-i$

11. 24

12. $-i$

13. 1

14. -1

15. -25

16. $75\sqrt{3}i$

17. $72\sqrt{3}i$

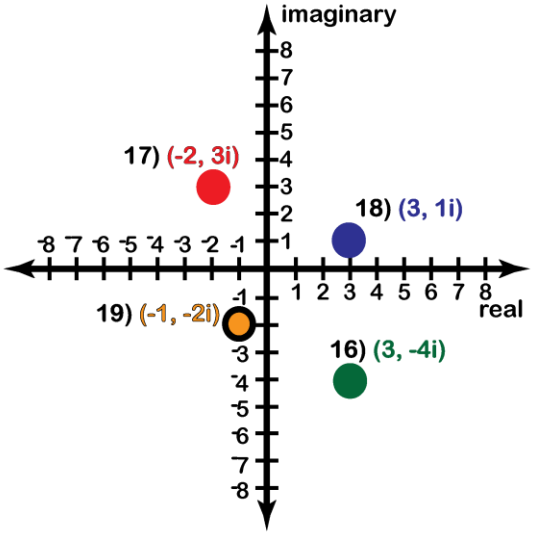
18. $-720\sqrt{15}i$

4.5 Complex Numbers

Answers

1. A real number and an imaginary number.
2. A graphical representation of the set of all complex numbers
3. $13 - 7i$
4. $5\sqrt{3} + \frac{1}{4}i$
5. $-3 - \frac{5}{13}i$
6. $-6 + 8i$
7. $10 - \frac{1}{3}i$
8. $4 + 5\sqrt{10}i$
9. $9 \times 0.03i = .27i$
10. $3\sqrt{3} + 0.4i$
11. $10 + .7i$
12. $-3 + -0.42i$
13. $15 + 18j^4i\sqrt{2j}$
14. $4\sqrt{7} + 26bc^4i\sqrt{ba}$
15. $-2 + 2i$ and $4 - 2i$

16-19 See image below



4.6 Quadratic Formula and Complex Sums

Answers

1. $7 + 10i$
2. $12 + 16i$
3. $254i$
4. $168i$
5. $247i$
6. $1 + 3i$
7. $-12 - 17i$
8. $-51i$
9. $246i$
10. $377i$
11. $x = 2 \pm i$
12. $x = x = 1 \pm 2i$
13. $x = \frac{(5 \pm i\sqrt{327})}{(16)}$
14. $x = \frac{(-1 \pm 2i)}{(-5)}$
15. $x = \frac{(-3 \pm 5i\sqrt{3})}{12}$
16. Quadrant III
17. Quadrant IV
18. Not in a Quadrant : The point is on the y axis at -8
19. $-7 - 3i$: Graph should show a point 7 units left and 3 units down from the origin
20. $2 + 10i$: Graph should show a point 2 units right and 10 units up from the origin

4.7 Products and Quotients of Complex Numbers

Answers

1. -24
2. $72^2 - 126i - 11 = -126i - 83$
3. $-49i^2 - 35i = 35i + 49$
4. $12i + 5$
5. $264i$
6. -756
7. -2880
8. -7560
9. $88i^4 - 55i^3 - 72i + 45 = -17i + 133$
10. $\frac{13i + 9}{2} = 13i/2 + 9/2$
11. $\frac{-20i - 180}{164} = (5i/41) + (-45/41)$
12. $\frac{88i - 180}{208} = (11i/26) + (-45/52)$
13. $\frac{162}{63} = 18/7$
14. $0/-35 = 0$
15. $50/-55 = -10/11$
16. $2\sqrt{3}$
17. $-10\sqrt{7}$
18. $6\sqrt{10}$

4.8 Polar Form of Complex Numbers

Answers

1.
   a. $[\sqrt{2}, 45°]$
   b. $[1, 90°]$
   c. $[\sqrt{2}, 135°]$

2.
   a. $[2, 180°]$
   b. $[3, 90°]$
   c. $[\sqrt{13}, 124°]$

3.
   a. $[\sqrt{2}, 45°]$
   b. $[\sqrt{2}, -45°]$
   c. $[2, 0°]$

4.
   a. $[2, 60°]$
   b. $[2, -30°]$
   c. $[4, 30°]$

5. Polar form: $[6, 45°]$
   Rectangular form: $4.25 + 4.25i$

6. Rectangular after computation: $-2i$
   Trigonometric form: $rcis2\left(\frac{3p}{2}\right)$

7. Rectangular after computation: $1 + i$
   Trigonometric form: $rcis\sqrt{2}\left(\frac{p}{2}\right)$

8. Rectangular after computation: $\frac{-1+\sqrt{3}}{2} + 0i$
   Trigonometric form: » $rcis.732(2p)$

9. $[3.6, 214^o]$

10. $[4, 330^o]$

11. $-7.5 + 13i$

12. $6 + 10.4i$

13.

a. $[\sqrt{x^2 + y^2}, \left(\frac{1}{sin} \bullet \frac{y^2}{r^2}\right)]$

b. $(cos\theta + isin\theta)$ using θ from part a.

4.9 Product and Quotient Theorems

Answers

1. $4\sqrt{2}(\cos 15^\circ + i \sin 15^\circ)$
2. $8cis(60^o)$
3. $4 \text{ cis}\left(\frac{9p}{40}\right)$
4. $\frac{1}{3}\text{cis}\,(240^\circ)$
5. $\frac{3}{4}\text{cis}\,(220^\circ)$
6. $34 - 9i$
7. $.36 + 1.35i$
8. $\frac{3}{16}$
9. $0 + 40i$
10. $1.4 + \frac{4}{5}i$
11. $\frac{1}{2} + \frac{5}{16}i$
12. $-33 + 56i$
13. $\frac{11}{4} + 125i$
14. Rectangular form: $5.5 + 1.5i$

    Polar form (preferred): $[5.7, 15.25]$
15. $7\frac{1}{2} + \frac{11}{4}i$
16. 3+2.6i
17. $\frac{1}{6} + \frac{2}{7}i$
18. $\frac{23}{40} - \frac{27}{56}i$

4.10 Powers and Roots of Complex Numbers

Answers

1. $\frac{-1}{2}+\frac{5}{2}i$

2. 37

3. $\left(\frac{1}{2}-\frac{i\sqrt{3}}{2}\right)$

4. $4\sqrt{2}(\cos 15^\circ + i\sin 15^\circ)$

5. $8\ \text{cis}(60^\circ)$

6. $4\ \text{cis}\left(\frac{9p}{40}\right)$

7. $\frac{1}{3}\text{cis}(240^\circ)$

8. $\frac{3}{4}\text{cis}(220^\circ)$

9. $-\frac{27}{2}-\frac{27\sqrt{3}}{2}i$

10. $-2\sqrt{2}-2\sqrt{2}i$

11. -64

12. $\left(\sqrt[6]{2}\right)\text{cis}\,15^\circ, \sqrt[6]{2}\ \text{cis}\,135^\circ, \sqrt[6]{2}\ \text{cis}\,255^\circ,$

13. $2cis67.5^o,\ 2cis157.5^o,\ 2cis247.5^o,\ 2cis337.5^0$

14. $cis18^o,\ cis90^o,\ cis162^o,\ cis234^o,\ cis306^o$