Complex Numbers – Class Work

Simplify using i.

1. $\sqrt{-16}$
2. $\sqrt{-36b^4}$
3. $\sqrt{-8a^2}$
4. $\sqrt{-32x^6y^7}$
5. $\sqrt{-16}\cdot\sqrt{-25}$
6. $\sqrt{-8}\cdot\sqrt{-10}$
7. $3i\cdot 4i\cdot 5i$
8. $-2i\cdot 4i\cdot -6i\cdot 8i$
9. i^9
10. i^{22}
11. i^{75}

Complex Numbers – Homework

Simplify using i.

12. $\sqrt{-81}$
13. $\sqrt{-121b^8}$
14. $\sqrt{-18a^6}$
15. $\sqrt{-48x^5y^6}$
16. $\sqrt{-9}\cdot\sqrt{-4}$
17. $\sqrt{-12}\cdot\sqrt{-75}$
18. $2i\cdot 5i\cdot 7i$
19. $-i\cdot -3i\cdot -5i\cdot -7i$
20. i^{10}
21. i^{23}
22. i^{72}

Adding, Subtracting, and Multiplying Complex Numbers – Class Work

Simplify

23. $(6+5i)+(4+3i)$

24. $(7+4i)+(-2-2i)$

25. $(-3-2i)+(3-i)$

26. $(6+5i)-(4+3i)$

27. $(7+4i)-(-2-2i)$

28. $(-3-2i)-(3-i)$

29. $5(4-2i)$

30. $2i(-6+i)$

31. $(6+5i)(4+3i)$

32. $(7+4i)(-2-2i)$

33. $(-3-2i)(3-i)$

34. $(8-3i)(1-i)$

35. $(4-2i)^2$

36. $(-6+i)^2$

Adding, Subtracting, and Multiplying Complex Numbers – Homework

Simplify

37. $(2+3i)+(8+2i)$

38. $(4+9i)+(-4-9i)$

39. $(10-7i)+(5-3i)$

40. $(2+3i)-(8+2i)$

41. $(4+9i)-(-4-9i)$

42. $(10-7i)-(5-3i)$

43. $6(5-6i)$

44. $2i(4-3i)$

45. $(2+3i)(8+2i)$

46. $(4+9i)(-4-9i)$

47. $(10-7i)(5-3i)$

48. $(-6-i)(2-7i)$

49. $(6-3i)^2$

50. $(-7+2i)^2$

Dividing Complex Numbers – Class Work

Simplify

51. $\frac{2}{i}$

52. $\frac{3}{4i}$

53. $\frac{-2}{3i}$

54. $\frac{2+i}{i}$

55. $\frac{2}{1+i}$

56. $\frac{3}{2-i}$

57. $\frac{2+i}{3+i}$

58. $\frac{4-i}{3-2i}$

Dividing Complex Numbers – Homework

Simplify

59. $\frac{3}{i}$

60. $\frac{2}{5i}$

61. $\frac{-4}{7i}$

62. $\frac{4-i}{i}$

63. $\frac{8}{3+i}$

64. $\frac{2i}{4-i}$

65. $\frac{2-i}{2+3i}$

66. $\frac{5-i}{4-3i}$

Graphing Complex Numbers – Class Work

Determine the quadrant of each of the following.

67. 9 – 3i

68. -2 + 4i

69. (5 + 4i) – (6 – 3i)

70. -3i(4 – 5i)

71. $(2 + 3i)^2$

72. $\frac{3-i}{i}$

73. $\frac{2}{4+i}$

74. $\frac{5-3i}{2+4i}$

Homework

Determine the quadrant of each of the following.

75. -7 – 3i

76. 5 - 4i

77. (3 + 2i) – (-5 + 4i)

78. (3 – i)(-4 + 5i)

79. $(-1 + 5i)^2$

80. $\frac{-2-i}{3i}$

81. $\frac{4}{3-i}$

82. $\frac{-6+2i}{3-2i}$

Polar Properties – Class Work

Name the point three other ways using polar coordinates.

83. $\left[5, \frac{\pi}{2}\right]$

84. $\left[-4, \frac{2\pi}{3}\right]$

85. $\left[3, \frac{-4\pi}{7}\right]$

86. $[-6,0]$

Convert the point to rectangular form.

87. $\left[5, \frac{\pi}{2}\right]$

88. $\left[-4, \frac{2\pi}{3}\right]$

89. $\left[3, \frac{-4\pi}{7}\right]$

90. $[-6,0]$

Convert the point to polar form.

91. (3, 6)

92. (-4, 2)

93. (1, 0)

94. (7, 7)

Polar Properties – Homework

Name the point three other ways using polar coordinates.

95. $\left[7, \frac{\pi}{3}\right]$

96. $\left[-6, \frac{2\pi}{5}\right]$

97. $\left[2, \frac{-3\pi}{5}\right]$

98. $[3, \pi]$

Convert the point to rectangular form.

99. $\left[7, \frac{\pi}{3}\right]$

100. $\left[-6, \frac{2\pi}{5}\right]$

101. $\left[2, \frac{-3\pi}{5}\right]$

102. $[3, \pi]$

Convert the point to polar form.

103. (-3, 2)

104. (-7, -8)

105. (5, 10)

106. (-7, 0)

Geometry of Complex Numbers – Class Work

Let a =3 + 4i and b= -2 + 5i, perform the operation and write the answer in complex, rectangular, polar, and trigonometric forms.

107. a + b

108. b – a

109. ab

110. a^2

111. b^2

112. $3a^2b$

113. $a = 4(cos\frac{\pi}{4} + isin\frac{\pi}{4})$ and $b = 3(cos\frac{7\pi}{6} + isin\frac{7\pi}{6})$, find ab.

114. $c = \left[5, \frac{2\pi}{5}\right]$ and $d = \left[3, \frac{4\pi}{6}\right]$, find cd.

115. Find z if z[10, 80°]= [15, 140°]

Geometry of Complex Numbers – Homework

Let a =7 - 3i and b= -3 - 8i, perform the operation and write the answer in complex, rectangular, polar, and trigonometric forms.

116. a + b

117. a – b

118. b – a

119. ab

120. a^2

121. b^2

122. 3a

123. $3a^2b$

124. $a = 7(cos\frac{\pi}{3} + isin\frac{\pi}{3})$ and $b = 2(cos\frac{5\pi}{6} + isin\frac{5\pi}{6})$, find ab.

125. $c = \left[12, \frac{7\pi}{4}\right]$ and $d = \left[.5, \frac{5\pi}{3}\right]$, find cd.

126. Find z if z[20, 100°]= [15, 140°]

Polar Equations and Graphs – Class Work

127. Draw the graph of $r = \sin\theta$

128. Draw the graph of $r = 3 + cos\theta$

129. Draw the graph of $r = 5$

130. Draw the graph of $\theta = \frac{2\pi}{3}$

131. Draw the graph of $rcos\theta = 6$

Polar Equations and Graphs – Homework

132. Draw the graph of $r = cos\theta$

133. Draw the graph of $r = 4 + sin\theta$

134. Draw the graph of $r = -5$

135. Draw the graph of $\theta = \frac{3\pi}{4}$

136. Draw the graph of $rsin\theta = -6$

Rose Curves and Spirals – Class Work

137. How many petals and what is a petals length for $r = 4cos3\theta$? Draw the graph.

138. How many petals and what is a petals length for $r = 5sin6\theta$? Draw the graph.

139. How many petals and what is a petals length for $r = 2cos4\theta$? Draw the graph.

140. How many petals and what is a petals length for $r = 7cos5\theta$? Draw the graph.

141. What kind of spiral is $r = 3^{\theta}$?

142. What kind of spiral is $r = 2\theta + 2$?

Rose Curves and Spirals – Homework

143. How many petals and what is a petals length for $r = 6cos2\theta$? Draw the graph.

144. How many petals and what is a petals length for $r = 4sin7\theta$? Draw the graph.

145. How many petals and what is a petals length for $r = 3cos6\theta$? Draw the graph.

146. How many petals and what is a petals length for $r = 5cos3\theta$? Draw the graph.

147. What kind of spiral is $r = 2^{\theta}$?

148. What kind of spiral is $r = 3\theta + 1$?

Powers of Complex Numbers – Class Work

Compute the given power and write your answer in the original form.

149. $([3,60°])^5$

150. $\left(4\left(cos\frac{\pi}{5}+isin\frac{\pi}{5}\right)\right)^7$

151. $(5-6i)^6$

152. $(-5,9)^8$

153. If a tenth root of w is (3,8) what is w?

Homework

Compute the given power and write your answer in the original form.

154. $([9,80°])^7$

155. $\left(5\left(cos\frac{4\pi}{3}+isin\frac{4\pi}{3}\right)\right)^9$

156. $(-4+7i)^8$

157. $(-7,-3)^{10}$

158. If a sixth root of w is $7(cos0+isin0)$ what is w?

Roots of Complex Numbers – Class Work

Find the given roots and write the answer in the same form as the original.

159. fifth root of $[3,60°]$

160. fourth root of $4\left(cos\frac{\pi}{5}+isin\frac{\pi}{5}\right)$

161. sixth root of $5-6i$

162. eighth root of $(-5,9)$

163. a to the fourth is $\sqrt{3}(\cos 20° + isin\ 20°)$, find a

Homework

Find the given roots and write the answer in the same form as the original.

164. fifth root of $[9{,}80°]$

165. fourth root of $5\left(cos\frac{4\pi}{3}+isin\frac{4\pi}{3}\right)$

166. sixth root of $(-4+7i)$

167. eighth root of $(-7,-3)$

168. a to the sixth is $\sqrt{3}(\cos 30°+isin\ 30°)$, find a

Polar and Complex Numbers Unit Review

Multiple Choice

1. Simplify: $-4i \cdot 6i \cdot -2i \cdot -i$
   a. -48i
   b. 48i
   c. -48
   d. 48
2. Simplify: $(6 - i)^2$
   a. 35 + 12i
   b. 35 - 12i
   c. 37 - 12i
   d. 37 + 12i
3. Simplify: $\frac{3-i}{4-2i}$
   a. $\frac{7}{10} + \frac{1}{10}$i
   b. $\frac{7}{6} + \frac{1}{6}$i
   c. $\frac{7}{10} - \frac{1}{10}$i
   d. $\frac{7}{6} - \frac{1}{6}$i
4. What quadrant is (6 + 2i) – (7 – 4i) in?
   a. I
   b. II
   c. III
   d. IV
5. What quadrant is $(3 - 5\text{i})^2$ in?
   a. I
   b. II
   c. III
   d. IV
6. What quadrant is $\frac{3-i}{4-2i}$ in?
   a. I
   b. II
   c. III
   d. IV
7. Which of the point choices listed are not equal to: $\left[5, \frac{\pi}{2}\right]$
   a. (0,5)
   b. $5(cos\frac{\pi}{2} + isin\frac{\pi}{2})$
   c. $\left[-5, \frac{3\pi}{2}\right]$
   d. they are all equivalent

8. Convert the point to rectangular form: $\left[4,\frac{\pi}{3}\right]$
   a. $(2,\frac{\sqrt{3}}{2})$
   b. $\left(\frac{\sqrt{3}}{2},2\right)$
   c. $(2,\sqrt{3})$
   d. $\left(2,2\sqrt{3}\right)$
9. Convert the point to polar form: (2.5 , 6)
   a. $(6.5, 0.395)$
   b. $(6.5\ , 1.176°)$
   c. $(6.5\ , 22.620°)$
   d. $(6.5, 67.380°)$
10. Let a =8 - 2i and b= -5 - 7i, which of the following is not a + b?
   a. (3,-9)
   b. $\left[3\sqrt{10}, -71.565\right]$
   c. 10(cos 288.435° + i sin 288.435°)
   d. –(-3 + 9i)
11. $a = 6(cos\frac{\pi}{4} + isin\frac{\pi}{4})$ and $b = -3(cos\frac{5\pi}{3} + isin\frac{5\pi}{3})$, find ab.
   a. $-18(cos\frac{6\pi}{7} + isin\frac{6\pi}{7})$
   b. $-18(cos\frac{5\pi}{12} + isin\frac{5\pi}{12})$
   c. $-18(cos\frac{17\pi}{12} + isin\frac{17\pi}{12})$
   d. $-18(cos\frac{23\pi}{12} + isin\frac{23\pi}{12})$
12. How many petals and what is a petals length for $r = 4cos8\theta$?
   a. 4 petals, length 8
   b. 8 petals, length 4
   c. 8 petals, length 8
   d. 16 ptdals, length 4
13. Compute: $(7 - 3i)^6$
   a. (195112, 220.809°)
   b. (45.694, 220.809°)
   c. (195112, 1.871π)
   d. (45.694, 1.871π)
14. If a tenth root of w is $\left[5,\frac{2\pi}{3}\right]$, what is w?
   a. $\left[50,\frac{20\pi}{3}\right]$
   b. $\left[9765625,\frac{20\pi}{3}\right]$
   c. $\left[50,\frac{4\pi}{3}\right]$
   d. $\left[9765625,\frac{4\pi}{3}\right]$

15. Find the third root of 27 $\left(cos\frac{\pi}{2} - isin\frac{\pi}{2}\right)$

a. $\left[3, \frac{\pi}{6}\right]$

b. $\left[3, \frac{\pi+4k\pi}{6}\right]$ for k ∈ {1,2}

c. $\left[3, \frac{4+k\pi}{6}\right]$ for k ∈ {1,2,3}

d. $\left[3, \frac{\pi+4k\pi}{6}\right]$ for k ∈ {0,1,2}

Extended Response

16. Let a =8 - 2i and b= -5 - 7i.

a. Find $3a^2b$.

b. How far from the origin is a + b?

c. What is the angle of rotation of a+b?

17. Write an equation

a. for a rose curve with 8 petals of length 5

b. for a rose curve with 5 petals of length 6

c. a Spiral of Archimedes with 6π between the spirals