

Name _____

Find the magnitude and direction angle (to the nearest tenth) of the vector. Give the measure of the direction angle as an angle in $[0^\circ, 360^\circ)$.

- 1) $\langle 9, 9 \rangle$
 A) $9\sqrt{2}; 225^\circ$ B) 18; 45° C) 9; 225° D) $9\sqrt{2}; 45^\circ$

Find the component form for the vector \mathbf{v} with the given magnitude and direction angle θ .

- 2) $|\mathbf{v}| = 153.8, \theta = 121.6^\circ$
 A) $\langle 131.0, -80.6 \rangle$ B) $\langle -80.6, 131.0 \rangle$ C) $\langle 131.0, 80.6 \rangle$ D) $\langle 80.6, 131.0 \rangle$

Perform the indicated operation. Use the form $\langle a, b \rangle$ for vectors.

- 3) $\mathbf{v} = \langle -2, 7 \rangle, \mathbf{u} = \langle -2, 5 \rangle$; Find $8\mathbf{v} + 9\mathbf{u}$.
 A) $\langle 648, 504 \rangle$ B) $\langle 34, 101 \rangle$ C) $\langle 72, 63 \rangle$ D) $\langle 32, 108 \rangle$

- 4) $\mathbf{u} = \langle 11, -5 \rangle, \mathbf{v} = \langle 15, -14 \rangle$; Find $\mathbf{u} \cdot \mathbf{v}$.
 A) 165 B) 70 C) 95 D) 235

Find the smallest positive angle between the given vectors to the nearest tenth of a degree.

- 5) $\langle -6, -7 \rangle, \langle 5, 6 \rangle$
 A) 79.6° B) 89.6° C) 189.2° D) 179.2°

Write the vector as a linear combination of the unit vectors \mathbf{i} and \mathbf{j} .

- 6) $\langle -6, -3 \rangle$
 A) $-\frac{2}{\sqrt{5}}\mathbf{i} + \frac{1}{\sqrt{5}}\mathbf{j}$ B) $6\mathbf{i} + 3\mathbf{j}$ C) $-6\mathbf{i} - 3\mathbf{j}$ D) $-\frac{2}{\sqrt{5}}\mathbf{i} - \frac{1}{\sqrt{5}}\mathbf{j}$

Perform the specified calculation.

- 7) For the vector $\mathbf{u} = \langle -1, 2 \rangle$, calculate $|2\mathbf{u}|$.
 A) $\sqrt{10}$ B) $2\sqrt{10}$ C) $2\sqrt{5}$ D) $-2\sqrt{5}$

Find the magnitude of the resultant vector.

- 8) If $\mathbf{v} = -4\mathbf{i} + \mathbf{j}$ and $\mathbf{w} = -9\mathbf{i} + \mathbf{j}$
 A) 5 B) $3\sqrt{11}$ C) $\sqrt{173}$ D) $\sqrt{233}$

Solve.

- 9) Two forces of 80 N and 120 N (newtons) act on an object. The angle between the forces is 23° . Find the magnitude of the resultant and the angle that it makes with the smaller force.
 A) 197 N, 14° B) 195 N, 19° C) 14 N, 14° D) 196 N, 14°

Solve the problem.

10) An airplane flies on a compass heading of 90.0° at 290 mph. The wind affecting the plane is blowing from 303° at 40.0 mph. What is the true course and ground speed of the airplane? Round results to an appropriate number of significant digits.

- A) 84° , 314 mph B) 94° , 312 mph C) 94° , 324 mph D) 84° , 325 mph

Identify the complex number as real or imaginary.

11) 2π

- A) Imaginary B) Real

12) $-8 - 7i$

- A) Real B) Imaginary

Express in terms of i.

13) $\sqrt{-200}$

- A) $-10i\sqrt{2}$ B) $10\sqrt{2}$ C) $10i\sqrt{2}$ D) $-10\sqrt{2}$

Perform the indicated operation and write the answer in the form $a + bi$, where a and b are real numbers.

14) $(5 + 7i) - (-3 + i)$

- A) $8 - 6i$ B) $-8 - 6i$ C) $2 + 8i$ D) $8 + 6i$

15) $(7 + 6i)(9 - 4i)$

- A) $87 - 26i$ B) $87 + 26i$ C) $39 + 82i$ D) $-24i^2 + 26i + 63$

Evaluate the indicated power of i.

16) i^{61}

- A) 1 B) i C) -1 D) -i

Find the product of the complex number and its conjugate.

17) $3 + i\sqrt{13}$

- A) -4 B) 22 C) -160 D) 178

Write the quotient in the form $a + bi$.

18) $\frac{5 + 7i}{5 + 4i}$

- A) $-\frac{3}{41} - \frac{55}{41}i$ B) $-\frac{1}{3} - \frac{5}{3}i$ C) $\frac{53}{41} + \frac{15}{41}i$ D) $\frac{53}{9} - \frac{5}{3}i$

Write the expression in the form $a + bi$, where a and b are real numbers.

19) $\sqrt{-3} \cdot \sqrt{-3}$

- A) 3 B) -3 C) -3i D) $2i\sqrt{-3}$

Find the absolute value of the complex number. Round your answer to two decimal places, if necessary.

20) $3 - 3i$

- A) 9 B) 4.24 C) 3.46 D) 2.45

Write the complex number in trigonometric form, using degree measure for the argument.

21) $5\sqrt{3} - 5i$

A) $10(\cos(-60^\circ) + i \sin(-60^\circ))$

B) $10(\cos 150^\circ + i \sin 150^\circ)$

C) $10(\cos(-30^\circ) + i \sin(-30^\circ))$

D) $10(\cos 30^\circ + i \sin 30^\circ)$

Write the complex number in the form $a + bi$.

22) $6(\cos 330^\circ + i \sin 330^\circ)$

A) $-3\sqrt{3} + 3i$

B) $3\sqrt{3} + 3i$

C) $3\sqrt{3} - 3i$

D) $-3\sqrt{3} - 3i$

Perform the indicated operation. Write the answer in the form $a + bi$.

23) $3(\cos 30^\circ + i \sin 30^\circ) \cdot 2(\cos 90^\circ + i \sin 90^\circ)$

A) $2\sqrt{6} - \sqrt{2}i$

B) $-6 - 6\sqrt{3}i$

C) $-3 + 3\sqrt{3}i$

D) $3 - 12\sqrt{3}i$

24)
$$\frac{\sqrt{3}\left(\cos \frac{7\pi}{4} + i \sin \frac{7\pi}{4}\right)}{\sqrt{6}\left(\cos \frac{9\pi}{4} + i \sin \frac{9\pi}{4}\right)}$$

A) $-\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$

B) $\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i$

C) $\frac{\sqrt{2}}{2}$

D) $-\frac{\sqrt{2}}{2}i$

For the given complex number, determine the complex conjugate in trigonometric form.

25) $8\left(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12}\right)$

A) $\frac{1}{8}\left(\cos \frac{\pi}{12} + i \sin \left[-\frac{\pi}{12}\right]\right)$

B) $\frac{1}{8}\left(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12}\right)$

C) $8\left(\cos \frac{\pi}{12} + i \sin \left[-\frac{\pi}{12}\right]\right)$

D) $8\left(\cos \left[-\frac{\pi}{12}\right] + i \sin \frac{\pi}{12}\right)$

Find the product of the given complex number and its conjugate.

26) $2\sqrt{2}(\cos(25^\circ) + i \sin(25^\circ))$

A) $2\sqrt{2}$

B) 8

C) $8(\cos(25^\circ) + i \sin(-25^\circ))$

D) $2\sqrt{2}(\cos(25^\circ) + i \sin(-25^\circ))$

Use De Moivre's theorem to simplify the expression. Write the answer in $a + bi$ form.

27) $(1 + i)^{20}$

A) 1024i

B) -1024i

C) -1024

D) 1024

28) $(2 - 2i)^5$

A) $-64 + 64i$

B) $-\sqrt{2} + i\sqrt{2}$

C) $-128 + 128i$

D) $-64\sqrt{2} + 64i\sqrt{2}$

Find the indicated roots. Write the answer in trigonometric form.

29) Cube roots of $125(\cos 303^\circ + i \sin 303^\circ)$

A) $5(\cos 101^\circ + i \sin 101^\circ)$, $5(\cos 221^\circ + i \sin 221^\circ)$, $5(\cos 221^\circ + i \sin 221^\circ)$

B) $5(\cos 101^\circ + i \sin 101^\circ)$, $5(\cos 161^\circ + i \sin 161^\circ)$, $5(\cos 41^\circ + i \sin 41^\circ)$

C) $5(\cos 101^\circ + i \sin 101^\circ)$, $5(\cos 221^\circ + i \sin 221^\circ)$, $5(\cos 341^\circ + i \sin 341^\circ)$

D) $5(\cos 191^\circ + i \sin 191^\circ)$, $5(\cos 251^\circ + i \sin 251^\circ)$, $5(\cos 131^\circ + i \sin 131^\circ)$

Convert the rectangular coordinates to polar coordinates, using radian measure for the angle.

30) $(-2, -2)$

A) $\left(2\sqrt{2}, \frac{5\pi}{4}\right)$

B) $\left(-2\sqrt{2}, \frac{3\pi}{4}\right)$

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

D) $\left(-2\sqrt{2}, \frac{5\pi}{4}\right)$

Convert to rectangular coordinates.

31) $\left(-4, -\frac{\pi}{3}\right)$

A) $(2, 2\sqrt{3})$

B) $(-2, 2\sqrt{3})$

C) $(-2, -2\sqrt{3})$

D) $(2, -2\sqrt{3})$

For the given polar equation, write an equivalent rectangular equation.

32) $r = 5$

A) $x^2 + y^2 = 25$

B) $x^2 - y^2 = 25$

C) $x + y = 5$

D) $x + y = 25$

33) $r = \cos \theta$

A) $(x + y)^2 = x$

B) $(x + y)^2 = y$

C) $x^2 + y^2 = y$

D) $x^2 + y^2 = x$

For the given rectangular equation, write an equivalent polar equation.

34) $xy = 1$

A) $2r^2 \sin \theta \cos \theta = 1$

B) $r \sin 2\theta = 2$

C) $2r \sin \theta \cos \theta = 1$

D) $r^2 \sin 2\theta = 2$

35) $x^2 + y^2 = 169$

A) $r = 13 \cos \theta$

B) $r = 13$

C) $r = 13 \sin \theta$

D) $r = 169$

Graph the polar equation.

36) $r = 4 + 4 \sin \theta$

37) $r = 8 \sin 4\theta$

38) $r = 5$