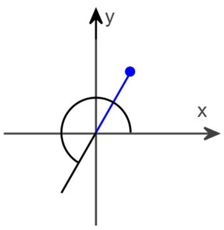
Student: ____________________ **Date:** ____________________	**Instructor:** Joe Betters **Course:** Pre-Calculus Pre AP (Master Course)	**Assignment:** Chapter 9 Review New

1. Plot the point given in polar coordinates.

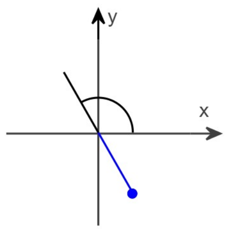
   $(-9, 120^\circ)$

   Choose the correct graph below.

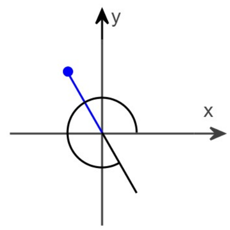
   ○ **A.**



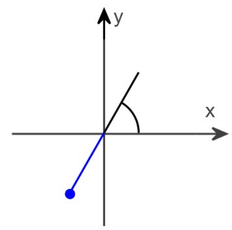
   ○ **B.**



   ○ **C.**



   ○ **D.**



   ID: 9.1.23

2. The polar coordinates of a point are given. Find the rectangular coordinates of this point.

   $(2.5, 2.8)$

   What are the rectangular coordinates of this point?

   ______

   (Type an ordered pair. Round to the nearest hundredth as needed.)

   ID: 9.1.53

3. The rectangular coordinates of a point are given. Find polar coordinates (r, θ) of this point with θ expressed in radians. Let $r > 0$ and $-2\pi < \theta < 2\pi$.

   $(2.3, 3.6)$

   One possibility for the polar coordinates of this point is ______.
   (Type an ordered pair. Type your answer in radians. Round to the nearest hundredth as needed.)

   ID: 9.1.65

4. The letters r and θ represent polar coordinates. Write the given equation using rectangular coordinates (x,y).

   $$r = \frac{6}{1 - \cos\theta}$$

   Complete the general form of the equation using rectangular coordinates.

   $0 =$ ______

   ID: 9.1.81

5. Identify and graph the polar equation.

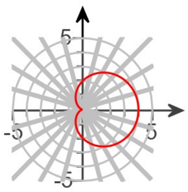
$r = 2 - 2\sin\theta$

What shape does the polar equation form when graphed?

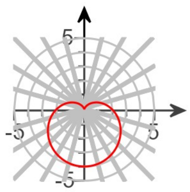
- **A.** Limacon without an inner loop.
- **B.** Limacon with an inner loop.
- **C.** Cardioid that is symmetric to the polar axis.
- **D.** Cardioid that is symmetric to line $\theta = \frac{\pi}{2}$.

Which graph represents the equation?

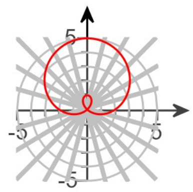
A.



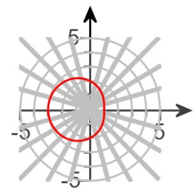
B.



C.



D.



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6. Identify and graph the polar equation.

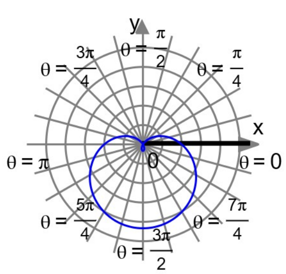
$r = 6 - 7\sin\theta$

What type of curve does the equation represent?

- **A.** a limacon without inner loop
- **B.** a limacon with inner loop
- **C.** a lemniscate
- **D.** a rose curve

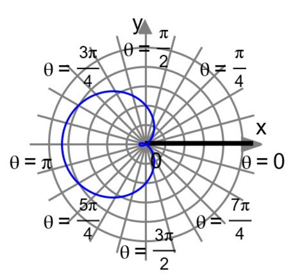
Which of the following is the graph of $r = 6 - 7\sin\theta$?

A.



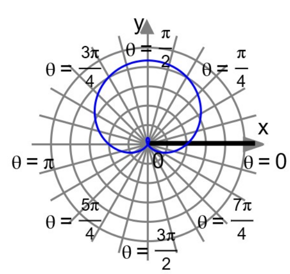
[− 15,15,3] [− 15,15,3]

B.



[− 15,15,3] [− 15,15,3]

C.



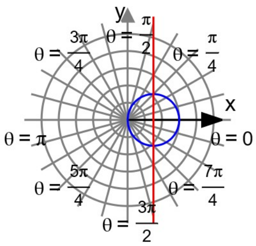
[− 15,15,3] [− 15,15,3]

ID: 9.2.47

7. Graph $r = 6\cos\theta$ and $r = 3\sec\theta$ on the same polar grid. Find the polar coordinates of the point(s) of intersection on the graph.

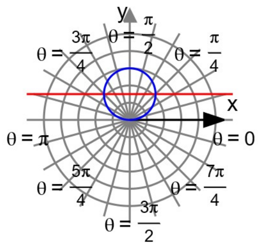
Choose the correct graph below. The function $r = 6\cos\theta$ is graphed in blue and the function $r = 3\sec\theta$ is graphed in red. Note that the r grid lines occur in increments of 2.

○ **A.**



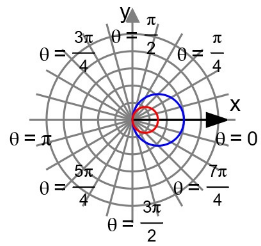
[−12, 12] by [−12,12]

○ **B.**



[−12, 12] by [−12,12]

○ **C.**



[−12, 12] by [−12,12]

Find the polar coordinates of the point(s) of intersection on the graph.

○ **A.** $\left(3,\frac{\pi}{4}\right), \left(3,\frac{5\pi}{4}\right)$

○ **B.** $\left(3\sqrt{2},\frac{\pi}{4}\right), \left(3\sqrt{2},\frac{7\pi}{4}\right)$

○ **C.** $\left(3\sqrt{2},\frac{\pi}{3}\right), \left(3\sqrt{2},\frac{7\pi}{3}\right)$

○ **D.** $\left(3,\frac{\pi}{3}\right), \left(3,\frac{5\pi}{3}\right)$

○ **E.** There are no intersection points.

ID: 9.2.61

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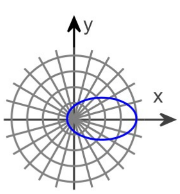
8. Graph the polar equation.

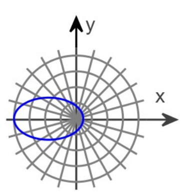
$$r = \frac{4}{5 + 4\sin\theta} \text{ (ellipse)}$$

Choose the correct graph below.

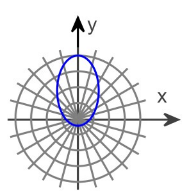
○ **A.**



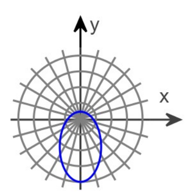
○ **B.**



○ **C.**



○ **D.**



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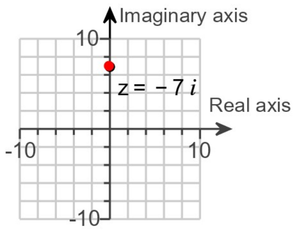
9. Plot the complex number in the complex plane and write it in polar form. Express the argument in degrees.

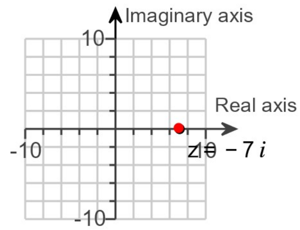
$-7i$

Choose the correct graph below.

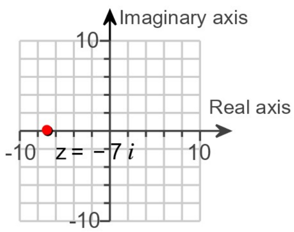
A.



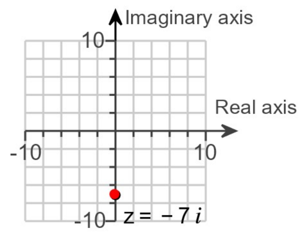
B.



C.



D.



What is the polar form of $-7i$?

_____ (**cos** _____ ° + i **sin** _____ °)

(Type an exact answer in the first answer box. Type any angle measures in degrees. Use angle measures greater than or equal to 0 and less than 360. Type all degree measures rounded to one decimal place as needed.)

ID: 9.3.15

10. Write the complex number in rectangular form.

$0.9(\cos 290^\circ + i \sin 290^\circ)$

$0.9(\cos 290^\circ + i \sin 290^\circ) =$ _____

(Do not round until the final answer. Then round to the nearest thousandth as needed.)

ID: 9.3.29

11. Find zw and $\frac{z}{w}$. Leave your answers in polar form.

$z = 4(\cos 130^\circ + i \sin 130^\circ)$
$w = 5(\cos 190^\circ + i \sin 190^\circ)$

What is the product?

_____ [cos _____° + i sin _____°]
(Simplify your answers. Type any angle measures in degrees. Use angle measures greater than or equal to 0 and less than 360.)

What is the quotient?

_____ [cos _____° + i sin _____°]
(Simplify your answers. Type any angle measures in degrees. Use angle measures greater than or equal to 0 and less than 360.)

ID: 9.3.35

12. Write the expression in the standard form a + b i.

$\left[\sqrt{7}(\cos 55^\circ + i \sin 55^\circ)\right]^6$

$\left[\sqrt{7}(\cos 55^\circ + i \sin 55^\circ)\right]^6 =$ _____
(Simplify your answer, including any radicals. Type your answer in the form a + bi. Use integers or fractions for any numbers in the expression.)

ID: 9.3.45

13. Find all the complex roots. Leave your answers in polar form with the argument in degrees.

The complex fourth roots of $64 + 64\sqrt{3}\, i$.

$z_k =$ _____ [cos (_____° + _____°k) + i sin (_____° + _____°k)] , k = 0,
(Simplify your answer, including any radicals. Type any angles in degrees between 0° and 360°.)

ID: 9.3.55

14. Find the unit vector in the same direction as **v**.

v = i − j

u = _____
(Simplify your answer. Type an exact answer, using radicals as needed. Type your answer in the form ai + bj. Use integers or fractions for any numbers in the expression.)

ID: 9.4.51

15. Write the vector **v** in the form a**i** + b**j**, given its magnitude is $\|\mathbf{v}\| = 33$ and the angle it makes with the positive x-axis is $\alpha = 240^{\circ}$.

v = ______ **i** − ______ **j**

(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

ID: 9.4.61

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16. Find the direction angle of **v** for the following vector.

$\mathbf{v} = -8\mathbf{i} - 3\mathbf{j}$

What is the direction angle of **v**?

______ °

(Round to one decimal place as needed.)

ID: 9.4.69

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17. An airplane has an airspeed of 470 kilometers per hour bearing N45°E. The wind velocity is 70 kilometers per hour in the direction N30°W. Find the resultant vector representing the path of the plane relative to the ground. What is the ground speed of the plane? What is its direction?

What is the actual ground speed of the aircraft?

______ kilometers per hour

(Round to the nearest tenth as needed.)

What is the actual direction of the aircraft relative to due north?

______ ° east of north

(Round to the nearest tenth as needed.)

ID: 9.4.79

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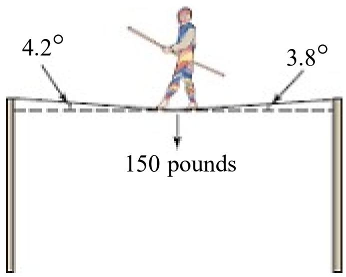
18. A tightrope walker located at a certain point deflects the rope as indicated in the figure. If the weight of the tightrope walker is 150 pounds, how much tension is in each part of the rope?



The tension in the left end of the rope is about ______ pounds.

(Do not round until the final answer. Then round to one decimal place as needed.)

The tension in the right end of the rope is about ______ pounds.

(Do not round until the final answer. Then round to one decimal place as needed.)

ID: 9.4.87

19. Find a so that the vectors $\mathbf{v} = \mathbf{i} - a\mathbf{j}$ and $\mathbf{w} = 6\mathbf{i} - 6\mathbf{j}$ are orthogonal.

a = ______ (Type an integer or a simplified fraction.)

ID: 9.5.17

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20. Decompose **v** into two vectors, $\mathbf{v}_1$ and $\mathbf{v}_2$, where $\mathbf{v}_1$ is parallel to **w** and $\mathbf{v}_2$ is orthogonal to **w**.

$\mathbf{v} = -\mathbf{i} - 2\mathbf{j}, \quad \mathbf{w} = \mathbf{i} - \mathbf{j}$

$\mathbf{v}_1 = (\_\_\_)\mathbf{i} + (\_\_\_)\mathbf{j}$ $\quad \mathbf{v}_2 = (\_\_\_)\mathbf{i} + (\_\_\_)\mathbf{j}$
(Simplify your answer.)

ID: 9.5.21

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21. The amount of energy collected by a solar panel depends on the intensity of the sun's rays and the area of the panel. Let the vector **I** represent the intensity, in watts per square centimeter, having the direction of the sun's rays. Let the vector **A** represent the area, in square centimeters, whose direction is the orientation of a solar panel. See the figure. The total number of watts collected by the solar panel is given by $\mathbf{W} = |\mathbf{I} \cdot \mathbf{A}|$. Suppose $\mathbf{I} = \langle -0.03, -0.02 \rangle$ and $\mathbf{A} = \langle 200, 150 \rangle$. Answer parts (a) − (c).

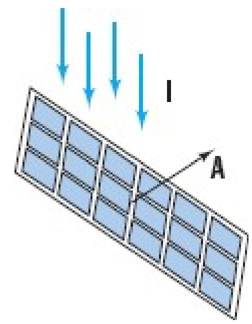


Figure is not to scale.

(a) Find $\|\mathbf{I}\|$ and $\|\mathbf{A}\|$.

$\|\mathbf{I}\| \approx$ ______ (Round to three decimal places as needed.)

$\|\mathbf{A}\| =$ ______

(b) Compute **W**.

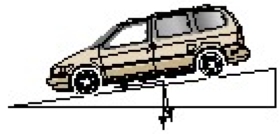
W = ______

(c) If the solar panel is to collect the maximum number of watts, what must be true about **I** and **A**?

- **A.** The angle between **I** and **A** should be 45° with the solar panels facing the sun.
- **B.** **I** and **A** should be orthogonal with the solar panels facing the sun.
- **C.** **I** and **A** should be parallel with the solar panels facing the sun.

ID: 9.5.27

22. A minivan with a gross weight of 5000 pounds is parked on a street with a slope of 8°. Find the force required to keep the vehicle from rolling down the hill. What is the force perpendicular to the hill?



What is the force required to keep the vehicle from rolling down the hill?

______ pounds (Round to one decimal place as needed.)

What is the force perpendicular to the hill?

______ pounds (Round to one decimal place as needed.)

ID: 9.5.29

23. Find the distance d from P_1 to P_2.

$P_1 = (3, -4, 1)$
$P_2 = (4, 0, 3)$

d = ______
(Simplify your answer. Type an exact value, using fractions and radicals as needed.)

ID: 9.6.17

24. The vector **v** has initial point P and terminal point Q. Write **v** in the form a**i** + b**j** + c**k**. That is, find its position vector.

$P = (1, -3, 3)$; $Q = (4, 0, 4)$

v = a**i** + b**j** + c**k** where

a = ______, b = ______, and c = ______.
(Simplify your answers. Type exact values, using fractions and radicals as needed. Type 1, − 1, or 0 when appropriate, even though these values are not usually shown explicitly when writing a vector in terms of its components.)

ID: 9.6.29

25. Find the unit vector having the same direction as **v**.

i − **j** + **k**

u = a**i** + b**j** + c**k** where

a = ______, b = ______, and c = ______.
(Simplify your answers. Type exact values, using fractions and radicals as needed. Type 1, − 1, or 0 when appropriate, even though these values are not usually shown explicitly when writing a vector in terms of its components.)

ID: 9.6.49

26. Find the dot product **v** • **w** and the angle between **v** and **w**.

$\mathbf{v} = 3\mathbf{i} - \mathbf{j} + 2\mathbf{k}$, $\mathbf{w} = -2\mathbf{i} - 3\mathbf{j} - 2\mathbf{k}$

v • **w** = ________

θ = ________° (Round to the nearest tenth as needed.)

ID: 9.6.55

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27. Find the direction angles of the vector. Write the vector in terms of its magnitude and direction cosines, $\mathbf{v} = \|\mathbf{v}\|[(\cos\alpha)\mathbf{i} + (\cos\beta)\mathbf{j} + (\cos\gamma)\mathbf{k}]$.

$\mathbf{v} = 2\mathbf{i} + \mathbf{j} + 3\mathbf{k}$

α = ________° (Round to the nearest tenth as needed.)

β = ________° (Round to the nearest tenth as needed.)

γ = ________° (Round to the nearest tenth as needed.)

Choose the correct answer below.

- **A.** $\mathbf{v} = \sqrt{14}\,[\cos(57.7^\circ)\mathbf{i} + \cos(74.5^\circ)\mathbf{j} + \cos(36.7^\circ)\mathbf{k}]$
- **B.** $\mathbf{v} = \sqrt{14}\,[\cos(36.7^\circ)\mathbf{i} + \cos(57.7^\circ)\mathbf{j} + \cos(74.5^\circ)\mathbf{k}]$
- **C.** $\mathbf{v} = \sqrt{14}\,[\cos(36.7^\circ)\mathbf{i} + \cos(57.7^\circ)\mathbf{j} + \cos(74.5^\circ)\mathbf{k}]$
- **D.** $\mathbf{v} = \sqrt{14}\,[\cos(74.5^\circ)\mathbf{i} + \cos(36.7^\circ)\mathbf{j} + \cos(57.7^\circ)\mathbf{k}]$

ID: 9.6.65

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28. The work W done by a constant force **F** in moving an object from a point A in space to a point B in space is defined as $W = \mathbf{F} \cdot \overrightarrow{AB}$. Find the work done by a force of 3 newtons acting in the direction $2\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ in moving an object 4 meters from (0,0,0) to (0,4,0).

W = ________ newton-meters (joules)

ID: 9.6.77

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29. Find (a) **v** × **w**, (b) **w** × **v**, (c) **v** × **v**, and (d) **w** × **w**.

$\mathbf{v} = 2\mathbf{i} - 3\mathbf{j} + 3\mathbf{k}$, $\mathbf{w} = 3\mathbf{j} - 2\mathbf{k}$

(a) **v** × **w** = ________ (Type your answer in the form ai + bj + ck.)

(b) **w** × **v** = ________ (Type your answer in the form ai + bj + ck.)

(c) **v** × **v** = ________ (Type your answer in the form ai + bj + ck.)

(d) **w** × **w** = ________ (Type your answer in the form ai + bj + ck.)

ID: 9.7.19

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30. Find $\mathbf{u} \times (\mathbf{v} \times \mathbf{v})$ for the given vectors.

$\mathbf{u} = \mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$, $\mathbf{v} = -4\mathbf{i} + 4\mathbf{j} + 4\mathbf{k}$

$\mathbf{u} \times (\mathbf{v} \times \mathbf{v}) = a\mathbf{i} + b\mathbf{j} + c\mathbf{k}$ where

a = ______, b = ______, and c = ______.
(Type exact values, in simplified form, using fractions and radicals as needed. Type 1, −1, or 0 when appropriate, even though these values are not usually shown explicitly when writing a vector in terms of its components.)

ID: 9.7.39

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31. Find a vector orthogonal to both **u** and **j** + **k**.

$\mathbf{u} = 2\mathbf{i} - 3\mathbf{j} + \mathbf{k}$

Which of the following vectors is orthogonal to both **u** and **j** + **k**?

- ○ $2\mathbf{i} + 4\mathbf{j} + 2\mathbf{k}$
- ○ $-4\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}$
- ○ $2\mathbf{i} - 4\mathbf{j} + 2\mathbf{k}$
- ○ $-4\mathbf{i} - 2\mathbf{j} + 2\mathbf{k}$

ID: 9.7.43

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32. Find the area of the parallelogram with vertices P_1, P_2, P_3, P_4

$P_1 = (1,2,3)$, $P_2 = (1,1,2)$, $P_3 = (0,-1,-1)$, $P_4 = (0,-2,-2)$

The area of the parallelogram is ______ square units.
(Simplify your answer. Type an exact value, using fractions and radicals as needed.)

ID: 9.7.49

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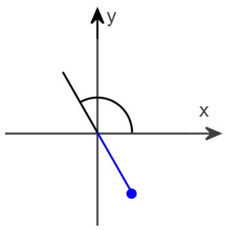
33. Find a unit vector normal to the plane containing
$\mathbf{u} = 3\mathbf{i} - 2\mathbf{j} - 2\mathbf{k}$ and $\mathbf{v} = -\mathbf{i} - \mathbf{j} + 2\mathbf{k}$.

A unit vector normal to the plane containing **u** and **v** is $a\mathbf{i} + b\mathbf{j} + c\mathbf{k}$ where

a = ______, b = ______, and c = ______.
(Simplify your answers, including any radicals. Use integers or fractions for any numbers in the expression.)

ID: 9.7.53

1. 

B.

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2. $(-2.36, 0.84)$

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3. $(4.27, 1.00)$

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4. $y^2 - 12x - 36$

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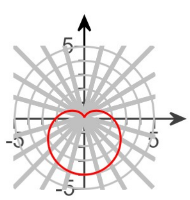
5. D. Cardioid that is symmetric to line $\theta = \frac{\pi}{2}$.



B.

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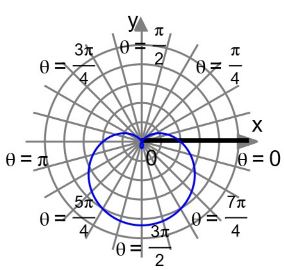
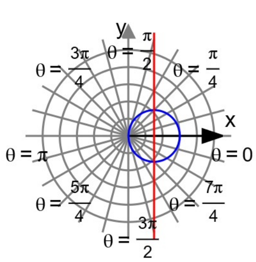
6. B. a limacon with inner loop



A. $[-15, 15, 3]$ $[-15, 15, 3]$

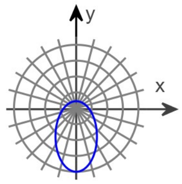
7.



A. $[-12, 12]$ by $[-12, 12]$

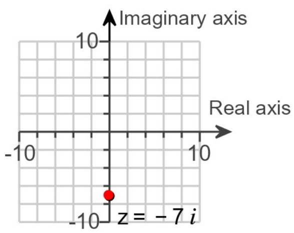
B. $\left(3\sqrt{2}, \frac{\pi}{4}\right), \left(3\sqrt{2}, \frac{7\pi}{4}\right)$

8.



D.

9.



D.

7

270

270

---

10. $0.308 - 0.846\,i$

---

11. 20

320

320

$\frac{4}{5}$

300

300

---

12. $\frac{343\sqrt{3}}{2} - \frac{343}{2}\,i$

---

13. $2\sqrt[4]{8}$

15

90

15

90

3

---

14. $\frac{\sqrt{2}}{2}\mathbf{i} - \frac{\sqrt{2}}{2}\mathbf{j}$

---

15. $-\frac{33}{2}$

$\frac{33\sqrt{3}}{2}$

---

16. 200.6

---

17. 492.8

37.1

---

18. 1075.4

1074.9

---

19. -1

---

20. $\frac{1}{2}$

$-\frac{1}{2}$

$-\frac{3}{2}$

$-\frac{3}{2}$

---

21. 0.036

250

9

C. **I** and **A** should be parallel with the solar panels facing the sun.

---

22. 695.9

4951.3

---

23. $\sqrt{21}$

---

24. 3

3

1

---

25. $\frac{\sqrt{3}}{3}$

$-\frac{\sqrt{3}}{3}$

$\frac{\sqrt{3}}{3}$

---

26. −7

117.0

---

27. 57.7

74.5

36.7

A. $\mathbf{v} = \sqrt{14}\,[\mathbf{cos}(57.7^\circ)\mathbf{i} + \mathbf{cos}(74.5^\circ)\mathbf{j} + \mathbf{cos}(36.7^\circ)\mathbf{k}]$

---

28. 8

---

29. −3i + 4j + 6k

3i − 4j − 6k

0

0

---

30. 0

0

0

---

31. $-4\mathbf{i} - 2\mathbf{j} + 2\mathbf{k}$

---

32. $\sqrt{3}$

---

33. $-\frac{6\sqrt{77}}{77}$

$-\frac{4\sqrt{77}}{77}$

$-\frac{5\sqrt{77}}{77}$