

Name: _____ Period: ____ Date: _____

NON-CALCULATOR SECTION

Vocabulary: Define each word and give an example.

1. vector projection
2. scalar
3. polar coordinates

Short Answer:

4. Describe how to test for symmetry over the x -axis on a polar curve.
5. What are all of the other ways to write the point r, θ in polar form?
6. How many petals are in the rose curve $r = a \cos n\theta$? (Note: You must answer for both cases (n odd and n even).

Review:

7. Write the expression in factored form involving one trigonometric function only:
 $\cos x - 2 \sin^2 x + 1$

8. Evaluate exactly:

a. $\sec \frac{4\pi}{3}$

b. $\sin \frac{3\pi}{4}$

c. $\tan 270^\circ$

Problems:

Be sure to show all work used to obtain your answer. Circle or box in the final answer.

9. Let $\mathbf{u} = \langle 5, -4 \rangle$, $\mathbf{v} = \langle 1, -2 \rangle$. Find $2\mathbf{u} - \mathbf{v}$.

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10. Find a unit vector in the direction of $\mathbf{v} = \langle 3, -1 \rangle$ and write your answer in component form.

11. Given that $P = 4, -1$ and $Q = 7, -2$, find the component form and magnitude of the vector \overrightarrow{PQ} .

12. Determine whether the vectors \mathbf{u} and \mathbf{v} are parallel, orthogonal, or neither.

$$\mathbf{u} = \langle 5, 3 \rangle, \mathbf{v} = \left\langle -\frac{10}{4}, -\frac{3}{2} \right\rangle$$

13. Find $\mathbf{a} \cdot \mathbf{b}$. $\mathbf{a} = 12\mathbf{i} - 4\mathbf{j}$, $\mathbf{b} = -3\mathbf{i} + \mathbf{j}$

14. Eliminate the parameter and identify the graph of the parametric curve.

$$x = t - 3 \text{ and } y = \frac{2}{t}$$

15. Eliminate the parameter and identify the graph of the parametric curve.

$$x = 9 \cos t, \quad y = 9 \sin t$$

16. Find the parametrization for a circle with center $(6, 7)$ and radius 8.

17. Plot the point with the polar coordinates $\left(-2, \frac{5\pi}{6}\right)$.

18. Find the rectangular coordinates of the point with the given polar coordinates.

$$(-2, 150^\circ)$$

19. Which of the following polar coordinate pairs does *not* represent the point with rectangular coordinates $-2, -2$?

A) $2\sqrt{2}, -135^\circ$ B) $2\sqrt{2}, 225^\circ$ C) $-2\sqrt{2}, 45^\circ$

D) $-2\sqrt{2}, -315^\circ$ E) $-2\sqrt{2}, 135^\circ$

20. Convert the rectangular equation to polar form: $3x + 2y = 4$

21. Convert the polar equation to rectangular form and identify the graph.
 $r = 2\sin\theta - 4\cos\theta$

22. Find the product: $(9 + 2i)(7 - 9i)$

23. Write the expression in standard form: $\frac{4 + 4i}{5 + 6i}$

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CALCULATOR SECTION

24. Find the component form of the vector with magnitude 8 and direction angle -20° .
25. Find the angle between the given vectors to the nearest tenth of a degree.
 $\mathbf{u} = \langle 5, -4 \rangle$, $\mathbf{v} = \langle 1, -2 \rangle$.
26. Determine if the graph is symmetric about the x -axis, y -axis, or the origin. Verify your answer algebraically. $r = 2 + 2\sin\theta$
27. Find the maximum r -value and name the graph of the polar curve $r = 2 + 3\cos\theta$.
28. Express the complex number $-1 + i\sqrt{2}$ in trigonometric form. Let $0 \leq \theta < 2\pi$.
29. Write the complex number in standard form. $3 \cos 150^\circ + i \sin 150^\circ$

30. Let $z_1 = \sqrt{3} \left(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4} \right)$ and $z_2 = \frac{1}{3} \left(\cos \frac{\pi}{6} + i \sin \frac{\pi}{6} \right)$

b. Find $z_1 \cdot z_2$ and write in standard form.

c. Find $\frac{z_1}{z_2}$ and write in standard form.

31. Use DeMoivre's theorem to find the indicated power of the complex number. Write your answer in standard form. $\left(\frac{1}{2} + i \frac{\sqrt{3}}{2} \right)^3$

32. Find the cube roots of $3 \left(\cos \frac{4\pi}{3} + i \sin \frac{4\pi}{3} \right)$.