

Trigonometric & Polar Functions



AP Precalculus 3-B Unit Review

Name _____

1. In the xy -plane, an angle is in standard position. The slope of the terminal ray of the angle is undefined. Which of the following could be the measure of the angle?

A. $\frac{\pi}{4}$ B. π C. $\frac{3\pi}{2}$ D. 2π

2. In the xy -plane, an angle is in standard position. The slope of the terminal ray of the angle is $-\frac{1}{\sqrt{3}}$. Which of the following could be the measure of the angle?

A. $\frac{\pi}{3}$ B. $\frac{2\pi}{3}$ C. $\frac{5\pi}{6}$ D. $\frac{7\pi}{6}$

3. In the xy -plane, an angle is in standard position with a measure of $\frac{7\pi}{4}$. What is the slope of the terminal ray of the angle?

4. List the period and the equation of one asymptote. $y = -\tan\left[3\left(x - \frac{\pi}{2}\right)\right] + 1$

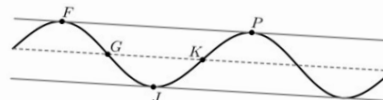


The figure shows a grandfather clock. The center of the clock is 54 inches above the floor. The minute hand is 5 inches long. At time $t = 0$ minutes, the minute hand is pointed directly down at the 6. Sixty minutes later, the minute hand is again pointing directly down at the 6. The distance between the tip of the minute hand and the floor periodically decreases and increases.

The periodic function h models the distance, in inches, between the tip of the minute hand and the floor as a function of time t in minutes.

17. The graph of h and its dashed midline for two full cycles is shown. Five points, F , G , J , K , and P are labeled on the graph. No scale is indicated, and no axes are presented.

Determine possible coordinates $(t, h(t))$ for the five points: F , G , J , K , and P .



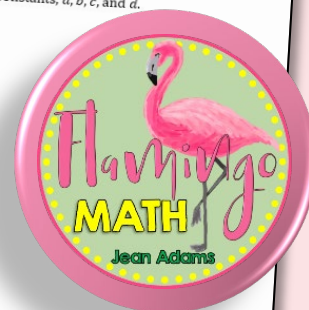
18. The function h can be written in the form $h(t) = a \sin(b(t - c)) + d$. Find the values of constants a , b , c , and d .

$a =$

$b =$

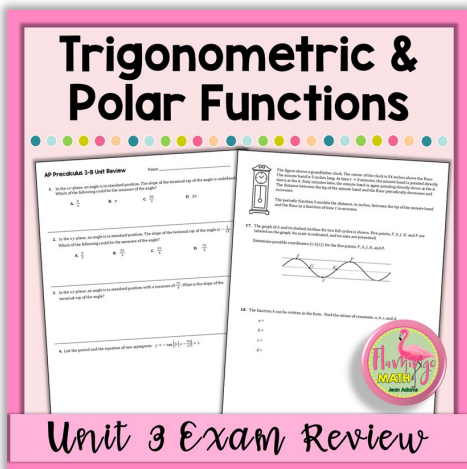
$c =$

$d =$



Unit 3 Exam Review

Trigonometric & Polar Functions



KEY CONCEPTS/TOPICS:

- ★ Use sinusoidal functions to analyze characteristics
- ★ Find coordinates of functions using the unit circle.
- ★ Solve trigonometric equations and inequalities.
- ★ Graph polar curves
- ★ Convert between polar and rectangular
- ★ Solve inequalities
- ★ Model real-world behavior and more!

Product Overview

Trigonometric & Polar Functions AP Exam Review

This resource is designed to help your AP Precalculus students prepare for the rigor of the AP Exam, using the language of Trigonometric and Polar Functions in a two-part review assignment.

Students will have 19 questions for Part 3-A Review and 34 questions for Part 2-B. Use this set in your year-end preparation for intense focused practice.

COLLEGE BOARD STANDARDS ALIGNMENT:

- Topic 3.1: Periodic Phenomena
- Topic 3.2: Sine, Cosine and Tangent
- Topic 3.3: Sine and Cosine Function Values
- Topic 3.4: Sine and Cosine Function Graphs
- Topic 3.5: Sinusoidal Functions
- Topic 3.9: Inverse Trigonometric Functions
- Topic 3.10: Trigonometric Equations and Inequalities
- Topic 3.11: Secant, Cosecant, and Cotangent Functions
- Topic 3.12: Equivalent Representations of Trigonometric Functions
- Topic 3.13: Trigonometry and Polar Coordinates
- Topic 3.14: Polar Function Graphs
- Topic 3.15: Logarithmic Rates of Change in Polar Functions

Unit 3-A Review

AP Precalculus 3-A Unit Review

Name _____

Use the table for problems 1 – 3.

The graph of $h(x)$ is periodic with a period of 4. Values of h are shown at selected values of x .

x	1	3	4	6
$h(x)$	-2	1	3	-1

Find the following values.

1. $h(-1)$ 2. $h(7)$ 3. $h(12)$

Use the following information for problems 4–6.

An angle θ is in standard position and intersects a circle with center at the origin and radius of 5 in. What is the length of the minor arc subtended by the angle?

4. $\sin \theta =$ 5. $\cos \theta =$ 6. $\tan \theta =$

For problems 7–12, find the exact value of each expression.

7. $\sin\left(\frac{4\pi}{3}\right) =$ 8. $\cos\left(\frac{3\pi}{4}\right) =$ 9. $\tan\left(\frac{\pi}{6}\right) =$

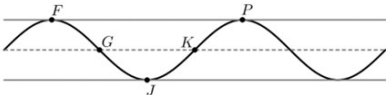
10. $\sin\left(-\frac{5\pi}{6}\right) =$ 11. $\cos\left(-\frac{\pi}{2}\right) =$ 12. $\tan\left(-\frac{3\pi}{4}\right) =$

The graph of h is shown. The graph is periodic with a period of 6. The function h models the distance, in inches, between the tip of the minute hand and the floor as a function of time t in minutes. The distance between the tip of the minute hand and the floor periodically decreases and increases.

The periodic function h models the distance, in inches, between the tip of the minute hand and the floor as a function of time t in minutes.

17. The graph of h and its dashed midline for two full cycles is shown. Five points, F, G, J, K , and P are labeled on the graph. No scale is indicated, and no axes are presented.

Determine possible coordinates $(t, h(t))$ for the five points: F, G, J, K , and P .



18. The function $h(x) = a \cos(bx + c) + d$ is shown. Determine the values of constants a, b, c , and d .

- $a =$
 $b =$
 $c =$
 $d =$

13. An angle in standard position has a measure of 0.725π and intersects a circle with center at the origin and radius of 5 in. What is the length of the minor arc subtended by the angle?

14. An angle in standard position intersects a circle with center at the origin and radius 8 in. If the length of the intercepted arc is 24 in, what is the measure of the angle?

15. An angle in standard position intersects a circle with center at the origin. If the measure of the angle is 6 and the measure of the intercepted arc is 18 in. What is the radius of the circle?

16. The terminal ray of an angle θ in standard position intersects a circle with center at the origin and radius 5 in at the point $(-5\sqrt{3}, -5)$. What are the values of θ and r ?

19. Refer to the graph of h in part problem 17. The t -coordinate of J is t_1 , and the t -coordinate of K is t_2 .

(i) On the interval (t_1, t_2) , which of the following is true about h ?

- a) h is positive and increasing
b) h is positive and decreasing
c) h is negative and increasing
d) h is negative and decreasing

(ii) On the interval (t_1, t_2) , describe the behavior of the function h . Determine whether the rate of change of h is increasing or decreasing.

Unit 3-B Review

AP Precalculus 3-B Unit Review

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2. In the xy -plane, an angle is in standard position. The slope of the terminal ray of the angle is $-\frac{1}{\sqrt{3}}$. Which of the following could be the measure of the angle?

A. $\frac{\pi}{3}$ B. $\frac{2\pi}{3}$ C. $\frac{5\pi}{6}$ D. $\frac{7\pi}{6}$

3. In the xy -plane, an angle is in standard position with a measure of $\frac{7\pi}{4}$. Which of the following could be the measure of the angle?

7. $\sin^{-1}\left(-\frac{1}{2}\right)$

Find all solutions to the equation.

8. $2 \sin x = \sqrt{3}$ 9. $\tan(x) + 1 = 0$

Solve on the domain $[0, 2)$

10. $4 \cos^2(x) - 1 = 0$ 11. $2 \sin^2(x) - \sin(x) - 1 = 0$

Point P is on the terminal side of angle θ in standard position. The coordinates of point P are $(-3, 4)$. Find each of the following.

22. $\cos(2\alpha)$

24. $\sin(\alpha + \beta)$

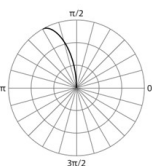
25. $\cos(\alpha + \beta)$

26. Convert the following polar coordinates to rectangular coordinates. Give the exact values.

$\left(6, -\frac{2\pi}{3}\right)$

27. Convert the following polar coordinates to rectangular coordinates. Give the exact values.

$(8, -8\sqrt{3})$



28. A portion of the graph of the polar function $r = f(\theta)$, where $f(\theta) = 3 \cos(3\theta)$, is shown in the polar coordinate system for $a \leq \theta \leq b$. If $0 \leq a < b < 2\pi$, which of the following could be the values for a and b ?

A. $a = 0$ and $b = \frac{\pi}{6}$
B. $a = \frac{\pi}{6}$ and $b = \frac{\pi}{3}$
C. $a = \frac{\pi}{3}$ and $b = \frac{\pi}{2}$
D. $a = \frac{\pi}{2}$ and $b = \frac{2\pi}{3}$

Use the following function for Items 29–34: $r = f(\theta) = 2 + 4 \cos \theta$

30. Find the intervals where r is positive or negative.

31. Find the intervals where r is increasing or decreasing.

14. $h(x) = \arccos\left(\frac{x}{2}\right)$. Solve $h(x) = \frac{\pi}{4}$ for values of x in the domain of h .

15. $m(x) = \tan\left(x - \frac{\pi}{4}\right)$. Find the x -coordinate of the point on the graph of m with an output value of $\frac{3\pi}{2}$.

16. What are all the values of θ on the interval $0 \leq \theta < 2\pi$, that satisfy the inequality? $2 \cos^2 \theta + \cos \theta > 1$

18. Let $h(x) = 5 - \frac{1}{2} \sec x$ and $k(x) = 6$. What are the x -coordinates of the points of intersection for the graphs of h and k on $[0, 2\pi)$?

19. Let $g(x) = (\csc x)(\cos x)$. Rewrite $g(x)$ as an expression involving $\tan x$ and no other trigonometric functions.

20. Let $k(x) = \frac{\cos^2 x}{\sin x}$. Rewrite $k(x)$ as a single term involving $\sin x$.

32. Find the intervals where the distance r from the origin is increasing or decreasing.

21. Let $f(x) = \cos x$

33. Find the values of θ where extrema occur.