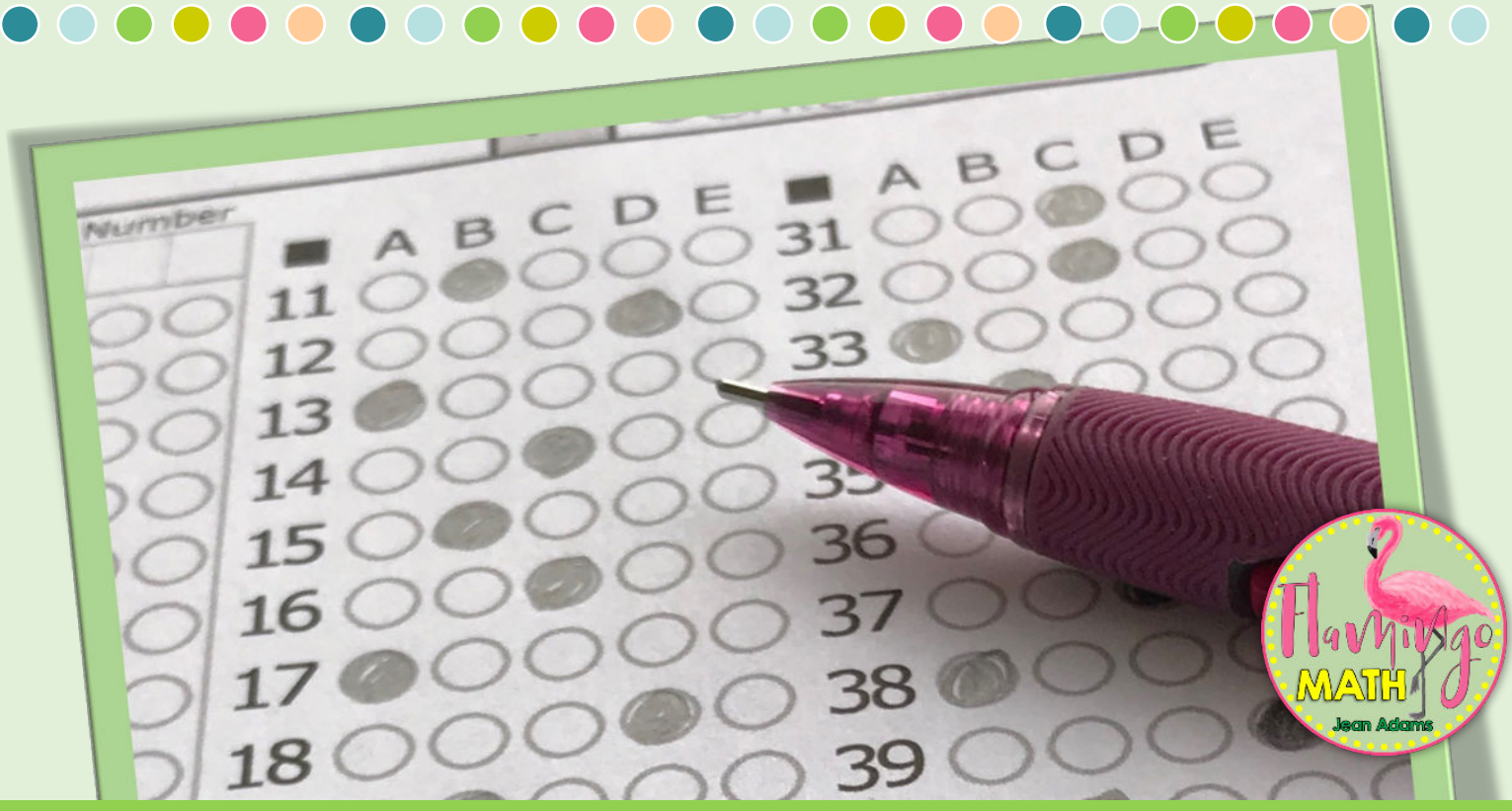
Precalculus Honors

Second Semester Exam



Editable Assessments

Precalculus Honors Second Semester Exam

This resource is designed for a Precalculus Honors course.

Product Overview

SECOND SEMESTER ONLY EDITABLE EXAM

This is a fully-editable Second Semester Only exam for PreCalculus Honors students.

The 50-question multiple-choice exam with answer key is divided into two sections. Section 1 is 30 questions without calculators, while Section 2 is 20 questions with calculators. There is a reference sheet, a page of graph paper, and cover documents.

The content covers the following units:

- ❑ Trigonometric Functions
- ❑ Analytic Trigonometry
- ❑ Additional Topics in Trigonometry
- ❑ Linear Systems and Matrices
- ❑ Topics in Analytic Geometry

There is a PDF format and a MICROSOFT POWERPOINT® version of the form that is fully editable if you need to adjust the questions to meet your district and personal needs.

You will also find a 50-question Bubble sheet document if you need one.

There are 24 pages of rigorous material to assess your students and test them at a level that lets you know their true abilities for the second semester.

Teacher Notes – Using the Resource

All test items are both in PDF format and Microsoft Word for creating and altering items to meet your teaching needs, *minimize your prep time, and offer a variety of assessment instruments.*.

Concepts on Calculator Inactive Questions:	
1.	Coterminal angles
2.	Convert degrees to radian measure
3.	Find radius given arc length and angle in a circle
4.	Find *b*-value from a trigonometric graph
5.	Find x-value where maximum occurs on a translate sine curve.
6.	Write a cosine function given period, amplitude, phase shift and translation
7.	Find interval where sine is greater than cosine
8.	Find vertical asymptote of a tangent function
9.	Define the trig ratio to be used that will calculate a side length in a right triangle
10.	Solve for height of a triangle symbolically
11.	Find exact solutions of a trig equation
12.	Find exact solutions of a trig equation by factoring
13.	Simplify a trigonometric identity
14.	Use difference formulas to simplify sine function.
15.	Given tangent of an angle and quadrant, find tangent of double angle
16.	Use sum of two angles to find cosine value
17.	Vector operations
18.	Find magnitude and direction angle given a vector
19.	Find the dot product between two vectors
20.	Write trigonometric form of a complex number is standard form
21.	Matrix operations
22.	Solve a matrix equation
23.	Find the inverse of a square matrix
24.	Find the determinant of a square matrix
25.	Use row echelon form operations
26.	Given vertex and directrix write the equation for a parabola
27.	Write an equation in standard form for an ellipse, given axis lengths.
28.	Eliminate the parameter to write an equation in x-y terms.
29.	Convert polar coordinates to rectangular coordinates
30.	Write the equation of a polar curve from the graph

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Concepts on Calculator Active Questions:	
31.	Solve trigonometric application of a right triangle.
32.	Find degree of an angle in a right triangle.
33.	Given graph, write component form of a vector
34.	Find exact value of inverse trig functions
35.	Find bearing direction for a real-world scenario
36.	Approximate values to find intersection of sine curve and a given value.
37.	Find area of a triangle using law of sines
38.	Find a length of a side using law of sines.
39.	Find the measure of an angle using law of cosines
40.	Write trig form of a complex number
41.	Divide trig form of complex numbers
42.	Convert polar equation to rectangular form
43.	Identify type of conic given a polar equation
44.	Find maximum r-value of an angle given a polar equation
45.	Find the polar coordinates given rectangular coordinates
46.	Simplify a trig identity and find an equivalent expression
47.	Solve real-world application for a vector given magnitude, find direction
48.	Find smallest solution value for an angle in a trigonometric formula.
49.	Write rectangular equation for two parametric equations.
50.	Write vertex form of a hyperbola given graph.

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PreCalculus Honors Semester 2 Exam

Name _____ Date _____

Calculator INACTIVE Questions: 1 - 30

1.	A	B	C	D	11.	A	B	C	D	21.	A	B	C	D
2.	F	G	H	J	12.	F	G	H	J	22.	F	G	H	J
3.	A	B	C	D	13.	A	B	C	D	23.	A	B	C	D
4.	F	G	H	J	14.	F	G	H	J	24.	F	G	H	J
5.	A	B	C	D	15.	A	B	C	D	25.	A	B	C	D
6.	F	G	H	J	16.	F	G	H	J	26.	F	G	H	J
7.	A	B	C	D	17.	A	B	C	D	27.	A	B	C	D
8.	F	G	H	J	18.	F	G	H	J	28.	F	G	H	J
9.	A	B	C	D	19.	A	B	C	D	29.	A	B	C	D
10.	F	G	H	J	20.	F	G	H	J	30.	F	G	H	J

Calculator ACTIVE Questions: 31 - 50

31.	A	B	C	D	41.	A	B	C	D
32.	F	G	H	J	42.	F	G	H	J
33.	A	B	C	D	43.	A	B	C	D
34.	F	G	H	J	44.	F	G	H	J
35.	A	B	C	D	45.	A	B	C	D
36.	F	G	H	J	46.	F	G	H	J
37.	A	B	C	D	47.	A	B	C	D
38.	F	G	H	J	48.	F	G	H	J
39.	A	B	C	D	49.	A	B	C	D
40.	F	G	H	J	50.	F	G	H	J

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PreCalculus Honors
Semester 2 Reference Sheet

Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1$$
$$1 + \tan^2 x = \sec^2 x$$
$$1 + \cot^2 x = \csc^2 x$$

Sum Identities

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$
$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$
$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

Difference Identities

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$
$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$
$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Law of Sines and Cosines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$b^2 = a^2 + c^2 - 2ac \cos B$$
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Half-Angle Identities

$$\sin\frac{x}{2} = \pm\sqrt{\frac{1 - \cos x}{2}}$$
$$\cos\frac{x}{2} = \pm\sqrt{\frac{1 + \cos x}{2}}$$
$$\tan\frac{x}{2} = \frac{1 - \cos x}{\sin x}$$
$$\tan\frac{x}{2} = \frac{\sin x}{1 + \cos x}$$

Double Angle Identities

$$\sin 2\theta = 2 \sin\theta \cos\theta$$
$$\cos 2\theta = \cos^2\theta - \sin^2\theta$$
$$\cos 2\theta = 2\cos^2\theta - 1$$
$$\cos 2\theta = 2\cos^2\theta - 1$$
$$\tan 2\theta = \frac{2\tan\theta}{1 - \tan^2\theta}$$

Polar and Rectangular Coordinates; Trigonometric Form of a Complex Number

$$x = r\cos\theta$$
$$y = r\sin\theta$$
$$x^2 + y^2 = r^2$$
$$\tan\theta = \frac{y}{x}$$
$$x + yi = r(\cos\theta + i\sin\theta)$$

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PRECALCULUS HONORS
Semester 2 Exam

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Section I: No Calculator Allowed
Questions #1 - 30

Please do not write on this test.
Bubble your answers on the answer sheet.

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1. Which of the following angles is coterminal to $-610°$?

[A] $20°$ **[B]** $70°$

[C] $110°$ **[D]** $250°$

2. Convert $600°$ to radians in terms of π

[F] $\frac{5\pi}{3}$ **[G]** $\frac{10\pi}{3}$

[H] $\frac{7\pi}{6}$ **[J]** $\frac{11\pi}{6}$

3. Given a circle, an arc 60 inches long subtends an angle of 5 radians. Find the length of the radius of the circle in inches?

[A] 8 in. **[B]** 24 in.

[C] 300 in. **[D]** 12 in.

7. The inequality $\sin\theta \geq \cos\theta$ is true for all values of θ on the interval:

[A] $45° \leq \theta \leq 225°$ **[B]** $0° \leq \theta \leq 360°$

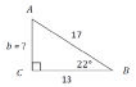
[C] $0° \leq \theta \leq 90°$ **[D]** $45° \leq \theta \leq 315°$

8. For which value of θ is $y = \tan 2\theta$ undefined?

[F] $\theta = 0$ **[G]** $\theta = \frac{\pi}{2}$

[H] $\theta = \frac{\pi}{4}$ **[J]** $\theta = \pi$

9. In the triangle shown below right, which of the following equations can be used to find the length of side b?



[A] $\tan 22° = \frac{b}{17}$

[B] $\tan 22° = \frac{13}{b}$

[C] $\tan 22° = \frac{b}{13}$

[D] $\tan 22° = \frac{17}{b}$

10. Solve for height, h, in terms of a:



[F] $3\sqrt{a}$

[G] $\frac{a}{2}$

[H] $\frac{a\sqrt{3}}{2}$

[J] $\frac{a\sqrt{2}}{2}$

11. Solve $2\sin\theta + \sqrt{3} = 0$, for $0 < \theta < 2\pi$

[A] $\frac{\pi}{3}, \frac{5\pi}{3}$ **[B]** $\frac{4\pi}{3}, \frac{5\pi}{3}$

[C] $\frac{\pi}{3}, \frac{2\pi}{3}$ **[D]** $\frac{5\pi}{6}, \frac{7\pi}{6}$

12. Find all solutions for $2\cos^3 x + \cos^2 x = 0$ on the interval $0 \leq x < 2\pi$

[F] $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}$

[G] $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{6}$

[H] $\frac{4\pi}{3}, \frac{5\pi}{3}$

[J] $\frac{2\pi}{3}, \frac{7\pi}{6}$

10. Solve for height, h, in terms of a:



[F] $3\sqrt{a}$

[G] $\frac{a}{2}$

[H] $\frac{a\sqrt{3}}{2}$

[J] $\frac{a\sqrt{2}}{2}$

11. Solve $2\sin\theta + \sqrt{3} = 0$, for $0 < \theta < 2\pi$

[A] $\frac{\pi}{3}, \frac{5\pi}{3}$ **[B]** $\frac{4\pi}{3}, \frac{5\pi}{3}$

[C] $\frac{\pi}{3}, \frac{2\pi}{3}$ **[D]** $\frac{5\pi}{6}, \frac{7\pi}{6}$

12. Find all solutions for $2\cos^3 x + \cos^2 x = 0$ on the interval $0 \leq x < 2\pi$

[F] $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}$

[G] $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{6}$

[H] $\frac{4\pi}{3}, \frac{5\pi}{3}$

[J] $\frac{2\pi}{3}, \frac{7\pi}{6}$

13. Simplify. $\sec^4 x + \sec^2 x - 2$

[A] $2 + \tan^4 x$ **[B]** $2\tan^2 x$

[C] $2 + \tan^2 x$ **[D]** $\tan^2 x\,(\sec^2 x + 2)$

14. Simplify: $\sin\left(x - \frac{\pi}{6}\right)$

[F] $\frac{1}{2}\left(\sin x + \sqrt{3}\cos x\right)$ **[G]** $\frac{1}{2}\left(\sqrt{3}\sin x \cos x\right)$

[H] $\frac{1}{2}\left(\sqrt{3}\sin x - \cos x\right)$ **[J]** $\sin x - \frac{1}{2}$

15. Given $\tan\theta = \frac{3}{4}$ and $\sin\theta < 0$, find $\tan 2\theta$.

[A] $\frac{5}{9}$ **[B]** $\frac{24}{7}$

[C] $\frac{1}{3}$ **[D]** $\frac{\sqrt{5}}{3}$

16. Find an exact value cos 75°

[F] $\frac{\sqrt{2}-\sqrt{6}}{4}$ [G] $\sqrt{6}-\sqrt{2}$

[H] $\sqrt{2}-\sqrt{6}$ [J] $\frac{\sqrt{6}-\sqrt{2}}{4}$

17. Given vectors $\mathbf{u} = \langle 5, 6\rangle$ and $\mathbf{v} = \langle -7, 2\rangle$, find $9\mathbf{u} - 5\mathbf{v}$.

[A] $\langle 5, 58\rangle$ [B] $\langle 85, 28\rangle$

[C] $\langle 75, 38\rangle$ [D] $\langle -16, -40\rangle$

18. Find the magnitude and direction angle for the vector $\langle -4, 4\sqrt{3}\rangle$

[F] 8, 120° [G] 8, 240°

[H] 12, 240° [J] 12, 300°

19. Given vectors $\mathbf{u} = 2\mathbf{i} - 3\mathbf{j}$ and $\mathbf{v} = -2\mathbf{i} + 5\mathbf{j}$, find $\mathbf{u} \cdot \mathbf{v}$

[A] $-4\mathbf{i} - 15\mathbf{j}$ [B] -19

[C] $2\mathbf{j}$ [D] $\sqrt{241}$

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20. Rewrite in standard form: $4(\cos 210° + i \sin 210°)$

[F] $\frac{\sqrt{3}}{2} - i$ [G] $-1 - 2i\sqrt{3}$

[H] $-2\sqrt{3} - 2i$ [J] $-2 + 2i\sqrt{3}$

21. Find the sum of $3\mathbf{A} + \mathbf{B}$, given the matrices: $A = \begin{bmatrix} 2 & 3 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -1 & 6 \end{bmatrix}$

[A] $\begin{bmatrix} 6 & 13 \\ 5 & 21 \end{bmatrix}$ [B] $\begin{bmatrix} 6 & 21 \\ 3 & 33 \end{bmatrix}$

[C] $\begin{bmatrix} 6 & 7 \\ 5 & 11 \end{bmatrix}$ [D] $\begin{bmatrix} 6 & 13 \\ 1 & 11 \end{bmatrix}$

22. Solve for X, given $2X + A = B$, where $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 5 \\ -1 & 6 \end{bmatrix}$

[F] $\begin{bmatrix} 4 & 0 \\ 4 & 2 \end{bmatrix}$ [G] $\begin{bmatrix} 0 & 1 \\ -3 & 4 \end{bmatrix}$

[H] $\begin{bmatrix} 0 & 2 \\ -6 & 8 \end{bmatrix}$ [J] $\begin{bmatrix} 2 & 4 \\ 2 & 2 \end{bmatrix}$

23. Given matrix $A = \begin{bmatrix} 3 & -2 \\ 1 & 2 \end{bmatrix}$, find the inverse matrix A^{-1}

[A] $\begin{bmatrix} 3 & -2 \\ -2 & 1 \end{bmatrix}$ [B] $\frac{1}{7}\begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$

[C] $\begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$ [D] $\begin{bmatrix} -2 & 1 \\ 3 & -2 \end{bmatrix}$

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24. Find the determinant of the square matrix $\begin{bmatrix} 6 & 4 \\ 2 & -1 \end{bmatrix}$

[F] 14 [G] 2

[H] -2 [J] -14

25. Suppose you are solving a system of equations by using row echelon form. What row transformation would you perform next on the the matrix below?

$$\begin{bmatrix} 1 & 4 & 11 & 10 \\ 0 & 1 & -8 & -13 \\ 0 & -6 & -2 & 5 \end{bmatrix}$$

[A] Add 6 times row 2 to row 3

[B] Add 6 times row 1 to 4 times row 3

[C] multiply row 3 by $-\frac{1}{2}$

[D] Add row 1 to -4 time row 2

26. Write the equation of the parabola with vertex (0,0) and directrix $x = 7$

[F] $x^2 = -28y$ [G] $y^2 = -28x$

[H] $x^2 = 28y$ [J] $y^2 = 28x$

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27. Write the equation, in standard form, for the ellipse whose vertical major axis is of length 18, and the minor axis is of length 10.

[A] $\frac{x^2}{5} + \frac{y^2}{9} = 1$ [B] $\frac{x^2}{9} + \frac{y^2}{5} = 1$

[C] $\frac{x^2}{81} + \frac{y^2}{25} = 1$ [D] $\frac{x^2}{25} + \frac{y^2}{81} = 1$

28. Eliminate the parameter, $x = t + 4$, $y = t^2$

[F] $y = x^2 + 16$ [G] $y = \sqrt{x} + x + 4$

[H] $y = x^2 - 8x + 16$ [J] $y = \sqrt{x - 4}$

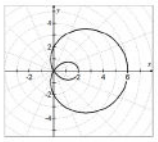
29. Find the rectangular coordinates of the point with the polar coordinates $\left(-4, -\frac{\pi}{3}\right)$

[A] $\left(-2, 2\sqrt{3}\right)$ [B] $\left(2, -2\sqrt{3}\right)$

[C] $\left(-2, -2\sqrt{3}\right)$ [D] $\left(2, 2\sqrt{3}\right)$

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30. Which of the following equations will produce the graph of the limacon curve shown below on the interval $0 \leq \theta < 2\pi$?



[F] $r = 2 + 4\sin\theta$ [G] $r = 4 + 2\cos\theta$

[H] $r = 4 + \cos\theta$ [J] $r = 2 + 4\cos\theta$

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PRECALCULUS HONORS
Semester 2 Exam

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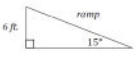
Section II: Calculator Active
Questions #30 - 50

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Bubble your answers on the answer sheet.

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31. A loading dock at a shipping company is 6 feet off the ground. The ramp approaching the dock requires an angle of 15° with the ground. Find the length of the ramp to the nearest hundredth.



[A] 18.33 feet [B] 23.18 feet

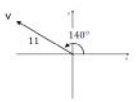
[C] 17.59 feet [D] 28.72 feet

32. In a right triangle ΔCAT, $m\angle A = 90°$, $CA = 4$, and $CT = 7$. What is $m\angle T$ to the nearest tenth of a degree?

[F] 34.8° [G] 38.4°

[H] 42.5° [J] 44.1°

33. Find the component form of the vector $\mathbf{v}$.



[A] $\langle -0.77, 0.64\rangle$

[B] $\langle -7.74, 7.74\rangle$

[C] $\langle -8.43, 7.07\rangle$

[D] $\langle -7.07, 8.43\rangle$

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34. Find the exact value : $\sin\left(\arctan\frac{3}{8}\right)$

[F] $\frac{8}{3}$ [G] $\frac{3\sqrt{55}}{55}$

[H] $\frac{3\sqrt{73}}{73}$ [J] $\frac{\sqrt{73}}{8}$

35. A charter boat is 90 miles south and 20 miles west of port. If the captain wants to travel directly to the port, what bearing should he set?

[A] S 77.5° W [B] S 12.5° E

[C] N 77.5° W [D] N 12.5° E

36. Use a calculator to approximate two values of θ that satisfy the equation $\sin\theta = 0.4794$ on the interval $0 \leq \theta < 2\pi$.

[F] 1.285, 2.642 [G] 1.285, 3.427

[H] 0.500, 3.427 [J] 0.500, 2.642

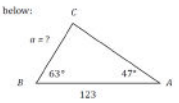
37. Find the area of the triangle ABC, given $A = 35°$, $a = 14.7$, $b = 14.7$

[A] 101.53 [B] 203.06

[C] 61.97 [D] 36.95

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38. Find the length of side a, given triangle shown below:



[F] 82.6

[G] 95.7

[H] 88.6

[J] 112.1

39. For the triangle with $a = 17$, $b = 39$, and $c = 50$, find A.

[A] 163.12° [B] 106.88°

[C] 16.88° [D] 73.12°

40. Write the trigonometric form of the complex number $7 - 5i$

[F] $8.6(\cos 324.5° + i\sin 324.5°)$ [G] $8.6(\cos 324.5° - i\sin 324.5°)$

[H] $7.4(\cos 144.5° - i\sin 144.5°)$ [J] $2(\cos 144.5° + i\sin 144.5°)$

41. Divide. $\frac{(\cos 25° + i\sin 25°)}{(\cos 75° + i\sin 75°)}$

[A] $-0.766 + 0.643i$ [B] $-0.643 - 0.766i$

[C] $0.643 - 0.766i$ [D] $0.766 - 0.643i$

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42. Convert the polar equation to rectangular form. $r = \dfrac{-2}{6 + 2\sin\theta}$

[F] $8x^2 + 2x + 9y^2 + 1 = 0$ **[G]** $9x^2 + 10y^2 - 2y - 1 = 0$

[H] $9x^2 + 8y^2 - 2y - 1 = 0$ **[J]** $9x^2 + 8y^2 - 2y + 1 = 0$

43. What type of conic section is represented by $r = \dfrac{15}{4 - \cos\theta}$

[A] circle **[B]** ellipse

[C] hyperbola **[D]** parabola

44. On the graph of the polar equation $r = 3 + 3\sin\theta$, find the maximum r-values of θ on $0 \le \theta < 2\pi$.

[F] $0, \pi$ **[G]** $0, \dfrac{\pi}{2}, \pi, \dfrac{3\pi}{2}$

[H] $\dfrac{\pi}{2}, \dfrac{3\pi}{2}$ **[J]** $\dfrac{\pi}{2}$

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45. What are the polar coordinates of $(5, 9)$?

[A] $\left(\sqrt{106}, 61°\right)$ **[B]** $\left(\sqrt{56}, 61°\right)$

[C] $\left(\sqrt{106}, 119°\right)$ **[D]** $\left(\sqrt{56}, 119°\right)$

46. Which expression is equivalent to $(\sec\theta)\left(\dfrac{\sin\theta}{\tan\theta}\right)$

[F] $\cot^2\theta - \csc^2\theta$ **[G]** $\csc^2\theta - \cot^2\theta$

[H] $\sin^2\theta - \cos^2\theta$ **[J]** $\cos^2\theta - \sin^2\theta$

47. A wind that is blowing from the northeast toward the southwest can be represented as a vector. The vector has both a westward component and a southward component. If the westward component has a magnitude of 7 miles per hour and the southward component has a magnitude of 20 miles per hour, in what direction is the wind blowing?

[A] The wind is blowing in the direction of 70.7° west of south.

[B] The wind is blowing in the direction of 66.5° west of south.

[C] The wind is blowing in the direction of 23.5° west of south.

[D] The wind is blowing in the direction of 19.3° west of south.

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48. Consider the formula $T = 591 - 76\cos 2\theta$, where θ is measured in degrees. To the nearest hundredth of a degree, what is the smallest positive value of θ for which the value of T will be 607 ?

[F] 51.08° **[G]** 102.15°

[H] 48.08° **[J]** 105.15°

49. Consider the two parametric equations shown below, where $t \ge 0$.

$$x = \frac{1}{2}\sqrt{t} + 4$$

$$y = 3t^2 - 5$$

Which rectangular equation can be used to graph the curve described by the parametric equations?

[A] $y = 12(x - 2)^4 - 5$

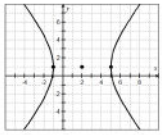
[B] $y = \dfrac{3}{4}(x + 2) - 5$

[C] $y = 48(x - 4)^4 - 5$

[D] $y = \dfrac{3}{2}(x + 4) - 5$

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50. Write the equation, in vertex form, for the hyperbola, shown below.



[F] $\dfrac{(x-2)^2}{16} - \dfrac{(y-1)^2}{9} = 1$ **[G]** $\dfrac{(x-2)^2}{9} - \dfrac{(y-1)^2}{16} = 1$

[H] $\dfrac{(x-1)^2}{9} - \dfrac{(y-2)^2}{16} = 1$ **[J]** $\dfrac{(y-1)^2}{16} - \dfrac{(x-2)^2}{9} = 1$

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