A, C, D, E, F are real numbers. 

\[ Ax^2 + Cy^2 + Dx + Ey + F = 0 \]

or

\[ Cx^2 + Dy^2 + Ex + Fy + F = 0 \]

The shaded region \( \mathcal{C} \) represents the set of all points \((x, y)\) such that \( x^2 + y^2 < 1 \). The transformation \( T \) maps the point \((x, y)\) to the point \((x', y')\), which is the image of the point \((x, y)\) under the transformation \( T \) by the following:

**Example:**

1. Draw the graph of the set \( C \) by putting checks under what the graphs could be depending on the sign of the \( x \)- and \( y \)-coordinates.
2. \( A, C, D, E, F \) are real numbers.

**Notes:**

- **Circle:** parabola opening up or down.
- **Parabola opening left or right:** ellipse.
- **Hyperbola:** hyperbola opening up/down left & right.
13. What is the equation describing the set of all points \((x, y)\) in the coordinate plane that are a distance of \(\sqrt{3}\) from a point \((2, -5)\)?

15. What is the equation of an ellipse centered at the origin and with axial intersections at \((0, \pm 3)\) and \((\pm 2, 0)\)?

16. If the length of the major axis of an ellipse is \(j\) and the length of the minor axis is \(n\), for the ellipse \(5x^2 + 24y^2 = 40\), then what is the value of \(j + n\)?

54. In the graph of the parametric equations \(\begin{cases} x = t^2 + t \\ y = t^2 - t \end{cases}\)\(\) \(\begin{align*} (A) & \ x \geq 0 \\ (B) & \ x \leq -1 \\ (C) & \ x \text{ is any real number} \end{align*}\)

55. The graph of \(\begin{cases} x = \sin^2 t \\ y = 2\cos t \end{cases}\) is a \(\begin{align*} (A) & \text{ straight line} \\ (B) & \text{ line segment} \\ (C) & \text{ parabola} \\ (D) & \text{ portion of a parabola} \end{align*}\) (Hint: it's not (C))

\[ \begin{align*} 1. & \quad \text{Get rid of } t \quad \begin{cases} x(t) = 20 t \\ y(t) \leq 5 \end{cases} \\ 2. & \quad \sin^2 t + \cos^2 t = 1 \quad \text{restriction} \\ 3. & \quad \text{...} \end{align*} \]
53. Graph the parametric equations
\[ \begin{align*}
    x &= 3t + 4 \\
    y &= t - 5
\end{align*} \quad t \in \mathbb{R} \]

Hints: 1. Get \( y \) in terms of \( x \), or use a trigonometric ID to eliminate the parameter \( t \).
2. Be careful of restrictions!

54. Sketch \( \begin{align*}
    x &= e^t \\
    y &= e^{at} \\
\end{align*} \quad t \in \mathbb{R} \)

55. Eliminate the parameter and sketch the graph of the curve that is given by the parametric equations
\[ \begin{align*}
    x &= 2 + 3\cos t \\
    y &= 3 + 2\sin t
\end{align*} \quad 0 \leq t \leq \pi \]

56. Which is the graph of \( y \) versus \( x \), where \( x \) and \( y \) are related by the parametric equations \( y = e^x \) and \( x = e^y \)?

Options:
(A) 
(B) 
(C) 
(D) 
(E)
21. Circle O is centered at (-3,1) with radius 4. Circle P is centered at (4,4) and has radius 2. If circle O is externally tangent to circle P, then what is the value of \( n \)? (Hint: draw, use distance formula)

22. Which of the following is the complete solution set of the system:

\[ A = \{(x,y): x^2 + y^2 = 25\} \] and

\[ B = \{(x,y): y = x+1\} \]

(A) \{(5,6), (6,7)\} (B) \{(6,7), (7,8)\} (C) \{(4,3)\} (D) \{(-2,-3)\} (E) \{(-2,3), (3,4)\}

23. Trigonometric Functions

24. Inverse Trigonometric Functions

25. The graph of \( y = f(x) \) is shown. \( f(x) \) is periodic. 2 cycles are pictured. What is \( f(89) \)?

(A) -2  
(B) -1  
(C) 0  
(D) 1  
(E) 2

26. \( g(x) \) has period T. What is the period of \( g(Ax+B) \)?

27. Determine the amplitude, period, and phase shift of \( y = -2 \sin \left( \frac{\pi}{2} x + \frac{3\pi}{2} \right) + 1 \)

28. \( y = 10 \sin (kx + \theta) \)

29. What is the coordinates of point P?

30. Write the equation for the graph below:

\[ y = \cos \left( \frac{\pi}{3} x \right) \]

(Hint: cosine ...)

31. As \( \theta \) increases from \( \frac{\pi}{4} \) to \( \frac{5\pi}{4} \), the value of \( 4 \cos^2 \theta \)

(A) increases, then decreases

(B) decreases, then increases

(C) decreases throughout

(D) increases throughout

(E) decreases, increases, then decreases

32. If \( 0 \leq x \leq \frac{\pi}{2} \), what is the maximum value of the function \( f(x) = \sin \left( \frac{3}{4} x \right) \)?

(Hint: it’s not \( \frac{1}{2} \))

33. Evaluate \( \tan^{-1} \left( \frac{3}{4} \right) \)

34. Evaluate \( \tan^{-1} \left( \tan 128^\circ \right) \)

(A) -128°  
(C) 52°  
(E) none of these

(B) -52°  
(D) 128°

35. Find the number of radians in \( \cot^{-1}(-5.2418) \)

(A) -10.39  
(C) 1.38  
(E) none of these

(B) -5.20  
(D) 0.19

(Hint: \( \cot^{-1}(-5.2418) = \theta \) Find \( \theta \).

36. If \( \frac{3\pi}{4} < \theta < \frac{5\pi}{4} \) and \( \sec \theta = 4 \), then \( \tan \theta = \)

(A) -3.93  
(C) 0.96  
(E) 3.93

(B) -3.87  
(D) 3.87

(Hint: Be careful of the quadrant)

37. What is a solution of \( \cos^3 x = \frac{1}{2} \)?

(A) 60°  
(B) 51°3  
(C) \( \cos^{-1} \left( \frac{1}{2} \right) \)

(D) \( \cos^{-1} \left( \frac{13}{2} \right) \)  
(E) \( \frac{1}{3} \cos^{-1} \left( \frac{1}{2} \right) \)
57. Which of the following is (are) true?
   I. \( \sin^{-1} 1 + \sin^{-1} (-1) = 0 \)
   II. \( \cos^{-1} 1 + \cos^{-1} (-1) = 0 \)
   III. \( \cos^{-1} x = \cos^{-1} (-x) \) for all \( x \) in the domain of \( \cos^{-1} \)
   (A) only I
   (B) only II
   (C) only III
   (D) only I and II
   (E) only II and III

58. (I) When is \( \cos^{-1} (\cos x) = x \)?
   (II) When is \( \tan(\tan^{-1} z) = z \)?

59. Without using a graphing calculator, sketch \( y = 3 \sin^{-1}(2x-8), + 5 \)

60. The graph of \( y = f(x) \) is shown at left, which could be true?

61. If \( g(x) = A \sin(Bx + C) + D \)
   \( A, B, C, D \) are constants. If \( g(x) \)
   is to be altered in such a way
   that both its period and amplitude
   are increased, which of the following
   must be increased?
   (A) \( |A| \) only
   (B) \( B \) only
   (C) \( C \) only
   (D) \( |A| \) and \( B \) only
   (E) \( C \) and \( D \) only

62. If \( \sin(\arccos x) = \frac{\sqrt{3} x}{2} \), then what is the value of \( x \)?
   (A) \( \frac{\sqrt{3}}{2} \)
   (B) \( \frac{3}{2} \)
   (C) \( \frac{\sqrt{3}}{3} \)
   (D) \( \frac{3}{\sqrt{3}} \)
   (E) \( \frac{3}{\sqrt{3}} \)

63. If \( \sin(\arccos x) = \frac{\sqrt{3} x}{2} \), then what is the value of \( x \)?
   (A) \( \frac{\sqrt{3}}{2} \)
   (B) \( \frac{3}{2} \)
   (C) \( \frac{\sqrt{3}}{3} \)
   (D) \( \frac{3}{\sqrt{3}} \)
   (E) \( \frac{3}{\sqrt{3}} \)

64. If \( 0 \leq n \leq \frac{\pi}{2} \) and \( \cos(\cos n) = 0.8 \)
   then \( \tan n = \)
   (A) 0.65
   (B) 0.75
   (C) 0.83
   (D) 1.19
   (E) 1.22

65. If \( \cos \Theta = \frac{3}{5} \), then where defined,
   \( \cos \Theta = \)
   (A) \( \frac{2}{5} \)
   (B) \( \frac{3}{5} \)
   (C) \( \frac{1}{5} \)
   (D) \( \frac{3}{5} \)
   (E) \( \frac{1}{5} \)

66. If \( \sin x = m \) and \( 0 < x < 90^\circ \),
   then \( \tan x = \)
   (A) \( \frac{1}{m} \)
   (B) \( \frac{1}{m^2} \)
   (C) \( \frac{1-m^2}{m} \)
   (D) \( \frac{m^2}{1-m^2} \)
   (E) \( \frac{1}{m^2} \)

67. If the ratio of \( \sec x \) to \( \csc x \)
   is \( 1:4 \), then the ratio of \( \tan x \)
   to \( \cot x \) is \( 1:5 \)
   (A) \( \frac{1}{16} \)
   (B) \( \frac{1}{4} \)
   (C) \( \frac{1}{16} \)
   (D) \( 4:1 \)
   (E) \( 16:1 \)

68. If \( y \) varies directly as the square of \( x \).
   When \( y = 2,5 \), \( x = 0.5 \).
   If \( y = 80 \), then \( x \) could equal
   (A) \( -2,5 \)
   (B) \( -8 \)
   (C) \( -10 \)
   (D) \( -16 \)
   (E) \( -64 \)
   (Hint \( y = kx^2 \))

69. If \( \tan \theta = 4 \), then which of the following could be the value of \( \theta \) in radian measure?
   (A) \( 0.785 \)
   (B) \( 3.73 \)
   (C) \( 1.509 \)
   (D) \( 1.509 \)
   (E) \( 1.509 \)
1. \( \tan x \cos x = \frac{\sin x}{\sin x} \)
   (A) \( \frac{1}{\cos x} \)  
   (C) 1  
   (E) tan x
   (B) \( \frac{1}{\sin x} \)  
   (D) \( \cos^2 x \)

2. \( \frac{1}{\cos x} - (\sin x)(\tan x) = \)
   (A) \( \cos x \)  
   (C) \( \tan x \)  
   (E) \( \sin x \)  
   (B) \( \sin x \)  
   (D) \( \cos^2 x \)

3. \( \frac{\tan x - \sin x \cos x}{\tan x} = \)
   (A) \( 1 - \cos x \)  
   (C) \( \tan x + 1 \)  
   (E) \( \sin^2 x \)  
   (B) \( 1 - \sin x \)  
   (D) \( \cos^3 x \)

4. \( 12\sqrt{3} - (8\cos x) \left( \frac{3\sqrt{3}}{2} \cos x \right) = \)
   (A) \( \sin^2 x \)  
   (C) \( 12\sqrt{3} \cos^3 x \)  
   (B) \( 12\sqrt{3} \sin^2 x \)  
   (E) \( 2\sqrt{3} - \frac{12\sqrt{3}}{2} \cos x \)  
   (C) \( 12\sqrt{3} - 12\sqrt{3} \cos x \)

5. If \( \cos 2A = \frac{7}{19} \), then \( \frac{1}{\cos^2 A - \sin^2 A} = \)
   (A) 0.04  
   (B) 0.37  
   (C) 0.74  
   (D) 1.36  
   (E) 2.71

6. \( x \) is in quadrant 3,
   \( \tan (x - 30^\circ) = \cot x \).
   Solve for \( x \)

7. \( \sin \Theta + \sin \Theta - \sin \Theta \cos^2 \Theta = \)
   (A) 0  
   (C) \( \sin \Theta \)  
   (E) \( 2 \sin \Theta \)  
   (B) \( \sin \Theta \)  
   (D) \( 2 \sin \Theta \)

8. \( \sin 2A = \frac{1}{2} \), then \( \frac{1}{\sin A \cos A} = \)
   (A) \( \frac{1}{2} \)  
   (B) \( \frac{1}{2} \)  
   (C) 2  
   (D) 3  
   (E) 4

9. If \( \cos x \sin x = 0.22 \), then \( (\cos x - \sin x)^2 = \)
   (A) 0  
   (B) 0.11  
   (C) 0.44  
   (D) 0.56  
   (E) 1.00

10. \sec^2 x - 1 = \)
    (A) \( \sin x \cos x \)  
    (C) \( \cos^2 x \)  
    (E) \( \tan^2 x \)  
    (B) \( \sec^2 x \)  
    (D) \( \sin^2 x \)

11. The polar equation \( r \sin \Theta = 1 \) graphs
    (A) a line  
    (C) a parabola  
    (E) a hyperbola
    (B) a circle  

12. If \( \cos 23^\circ = x \), find the value of \( \cos 46^\circ \) in terms of \( x \)

13. If \( \sec A = \csc B \), then
    (A) \( A = \Theta \)  
    (C) \( B = 90^\circ + A \)  
    (E) \( A + B = 180^\circ \)  
    (B) \( A = 90^\circ + B \)  
    (D) \( A + B = 90^\circ \)

14. For all \( \Theta \),
    \( \sin \Theta + \sin(\Theta + \pi) + \sin(2\Theta + \pi) = \)
    (A) \( -\sin \Theta \)  
    (C) \( 2 \sin \Theta \)  
    (E) \( 2 \sin \Theta + \cos \Theta \)  
    (B) \( \sin \Theta \)  
    (D) \( 3 \sin \Theta \)

15. What's the range of \( f(x) = -3 - 2 \sin(\pi x + 1) \)?

16. For \( 0 \leq x \leq \pi \), where is \( \frac{\tan x}{\sin x} \) defined?

17. If \( 0 \leq x \leq 2\pi \) and \( \sin x < 0 \),
    which of the following must be true?
    I. \( \cos x < 0 \)
    II. \( \csc x < 0 \)
    III. \( |\sin x + \cos x| > 0 \)
    (A) I only  
    (C) III only  
    (E) I and II
    (B) II only  
    (D) I and II

18. \( \sin \Theta = \frac{1}{z} \cos \Theta \), and \( \Theta \leq \frac{\pi}{2} \)
    Find the value of \( \frac{1}{2} \sin \Theta \) in terms of \( z \)

19. If \( x \geq 0 \) and \( \arcsin x = \arccos(2x) \)
    then \( x = \)
    (A) 0.566  
    (B) 0.500  
    (E) 0.245  
    (C) 0.747  
    (D) 0.447

20. \( \frac{1 - \cos 40^\circ}{2} = \)
    (A) \( \cos 20^\circ \)  
    (C) \( \tan 20^\circ \)  
    (E) \( \tan 80^\circ \)  
    (B) \( \sin 20^\circ \)  
    (D) \( \cos 80^\circ \)
21. If \( \cos \theta = x \cos \theta \), \( a = x \cos \theta \), \( b = x \sin \theta \)
then \( \sqrt{a^2 + b^2} = \)
(A) \(1\)  (C) \(x\)  (E) \(x \cos \theta \sin \theta\)
(B) \(x\)  (D) \(x \cos \theta + \sin \theta\)

22. If \( \cos 2x = \sin x \), and \( x \) is in radians, which is a possible value of \( x \)?
(A) \(0.39\)  (C) \(1.05\)  (E) \(2.09\)
(B) \(0.52\)  (D) \(1.60\)

23. If \( 0 < x < \frac{\pi}{2} \), and \( \tan x = \frac{3}{2} \), then
\( \cos x = \)
(A) \(\frac{3}{\sqrt{13}}\)  (C) \(\frac{2}{\sqrt{13}}\)  (E) \(\frac{2}{\sqrt{13}}\)
(B) \(\frac{3}{\sqrt{13}}\)  (D) \(\frac{2}{\sqrt{13}}\)

24. Given \( \cos \theta = - \frac{3}{5} \), \( \pi < \theta < \frac{3\pi}{2} \), find \( \sin 2\theta \)

25. If \( \sin 100^\circ = a \), express \( \sin 200^\circ \)
in terms of \( a \)

26. If \( \theta \) is an acute angle for which \( \tan \theta = 6 \tan \theta - 9 \), what is the degree measure of \( \theta \)?
(A) \(81.3\)  (C) \(71.6\)  (E) \(83.5\)
(B) \(60.0\)  (D) \(79.7\)

27. What is the \( y \)-coordinate of the point at which the graph of \( y = 2 \sin x - \cos 2x \) intersects the \( y \)-axis?
(A) \(-2\)  (C) \(0\)  (E) \(2\)
(B) \(-1\)  (D) \(1\)

28. Solve \( 2 \sin x + \cos 2x = 2 \sin^2 x - 1 \)
for \( 0 < x < 2\pi \)
(a) Algebraically
(b) check the answer with a graphing calculator

29. Find values of \( x \) on the interval \([0, \pi]\) for which \( \cos x > \sin 2x \)

30. For what values of \( x \), \( \pi < x < \frac{3\pi}{2} \), is \( \sin x < \cos x \)?

31. Given \( \sec \theta = -3 \) and \( \pi < \theta < \frac{3\pi}{2} \), find \( \tan \theta \)

32. If \( \frac{\pi}{2} < x < \pi \), and
\( \sin^2 x = a \), \( \cos^2 x = b \),
then \( \sin 2x + \cos 2x = \)
(A) \(2 \sqrt{ab} + b - a\)  (C) \(2ab + 2a - 1\)
(B) \(-2 \sqrt{ab} + b - a\)
(c) \(2 \sqrt{ab} - 2a - 1\)
(D) \(2 \sqrt{ab} - 2b + 1\)

Hints: These are practice problems about
IDS 1, 5, 7, 13, 26
Trig. function 14, 17
Triangles 18, 19, 23
Quadrant/ Triangle 24, 25, 31, 32
Solving 26, 30