

AP Calculus AB Summer Packet

**LIVE
LOVE
CALCULUS**

The accompanying problems are from the subjects covered in Algebra I, Algebra II, Pre-calculus, and Analytic Geometry. In Calculus you are expected to know all topics from these subjects.

Good luck and have fun.

AP Calculus AB Summer Packet

PCTI Mathematics Department

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Summer Packet Grading

- On the first day of school, the teacher will check for completion/effort of the packet.
- **This will be weighted at 50%.**
- Teacher will then review the packet with the students.
- Upon completion of the review, the students will be given an assessment based on the summer packet.
- **The assessment will be weighted at 50%.**
- **The two weighted scores combined will count as one project grade.**
- Therefore, the grade for the summer packet will be placed under the “project” category for Trimester 1.

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Show all your work.

Part 1: Solving Equations: Solve for x

1. $2(3^{4x-5}) + 4 = 11$
2. $\frac{6x-7}{4} + \frac{3x-5}{7} = \frac{5x+78}{28}$
3. $x^3 - 6x^2 - 27x = 0.$
4. $\sqrt{x+1} - 3x = 1$
5. $-\frac{2}{x^2} + \frac{1}{2(x-3)^2} = 0.$
6. $4lne = 4$
7. $x^4 - 6x^2 + 8 = 0.$
8. $2 \sin 3x - 1 = 0$
9. $\ln(x-3) + \ln(x-2) = \ln(2x+24)$
10. $2\cos^2 x - \sin x = 1$ and $0 \leq x \leq 2\pi$

Part 2: Equation of a line

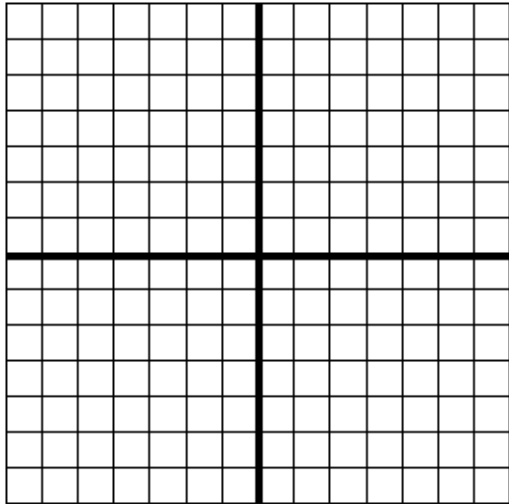
Find equation of the lines passing through (2,4) and having the following characteristics.

11. Slope of $-\frac{2}{3}$.
12. Perpendicular to the line $x + y = 0$.
13. Passing through the point (6,1).
14. Parallel to the x-axis.

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Part 3: Transformations: Sketch the following graphs

15. The function of $f(x)$ is defined: $H(x) = \begin{cases} 1, & x > 0 \\ -1, & x < 0 \end{cases}$



Sketch the following graphs:

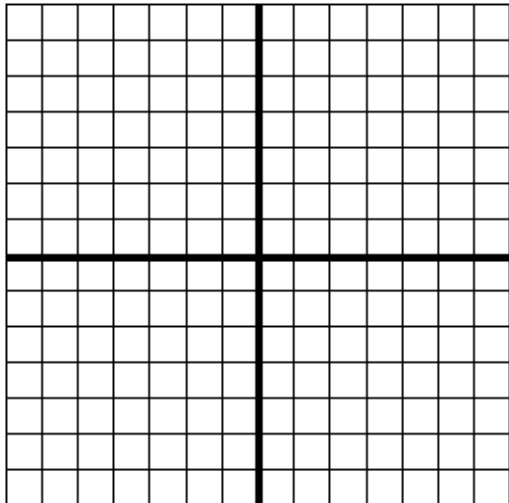
a.) $H(x) + 3$

b.) $H(x - 1)$

c.) $-2H(x)$

d.) $-H(x - 1) + 3$

16. The function of $g(x)$ is defined: $g(x) = \begin{cases} \sqrt{x}, & x \geq 0 \\ x, & x < 0 \end{cases}$



Sketch the following graphs:

a.) $g(x) - 2$

b.) $g(x - 2)$

c.) $-g(x)$

d.) $-g(x - 2) + 2$

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Part 4: Operations with functions:

Find each of the following functions or values given $f(x)$ and $g(x)$:

$$f(x) = 1 - x^2$$

$$g(x) = 2x + 1$$

17. $f(x) - g(x)$

18. $f(x)g(x)$

19. $f(g(1))$

20. $g(f(5))$

21. $f(g(x))$

22. $g(f(x))$

23. $g(g(x))$

Part 5: Tangent lines

24. Consider the circle $x^2 + y^2 - 6x - 8y = 0$.

- Find the center and the radius of the circle (change into $(x - a)^2 + (y - b)^2 = r^2$ where (a, b) are the coordinates of the center and r is the radius)
- Find an equation of the tangent line to the circle at the point $(0,0)$.
- Find an equation of the tangent line to the circle at the point $(6,0)$.
- Find the coordinates of the point where the two tangent lines intersect.

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Part6: Odd, Even, and Inverse Functions: Determine whether each function is odd, even, or neither

25. Is this function odd, even, or neither?

$$f(x) = x^6$$

26. Is this function odd, even, or neither?

$$f(x) = \cos(\cos(x))$$

27. Is this function odd, even, or neither?

$$f(x) = \sin(x)$$

28. Is this function odd, even, or neither?

$$f(x) = \tan(\sec(x))$$

29. If $f(x) = \sqrt{5x - 7}$, find the inverse.

30. If $f(x) = \frac{6-5x}{7}$, find the inverse.

31. If $f(x) = 6^{3+2x}$, find the inverse.

Part 7: Finding zeroes of a polynomial function using synthetic division:

32. Given the fact that one root of the given polynomial is $= 2$, find the other zeroes of

$$f(x) = 2x^3 - \frac{11}{3}x^2 - x + \frac{2}{3}.$$

33. If $(x + 5)$ is a factor of $g(x) = x^3 + 9x^2 + 23x + 15$ find the other two factors.

34. Find all zeroes of $f(x) = x^3 - x^2 - 14x + 24$.

35. Find all zeroes of $h(x) = 2x^4 - x^3 - 18x^2 + 9x$.

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Part 8: System of Equations: Find where the graphs intersect

36. $f(x) = 2x + 3$
 $g(x) = -.5x + 7$

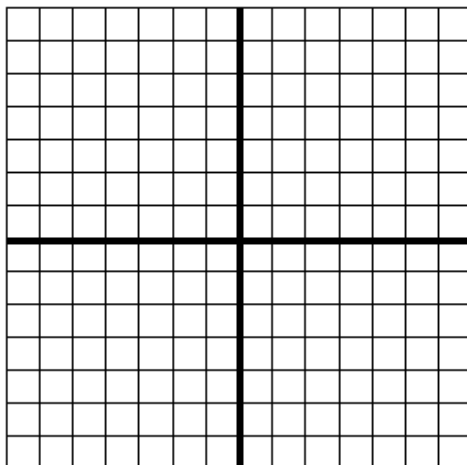
37. $f(x) = x^2$
 $g(x) = x + 2$

38. $f(x) = 6x^4 - 1$
 $g(x) = 3$

39. $y = -\frac{1}{5}x + \frac{1}{5}$
 $x = y^2 - 6y + 1$

Part 9: Piecewise Functions: Sketch the graph of $f(x)$ and find the indicated values:

40. $f(x) = \begin{cases} x - 2, & x < 0 \\ x^2 + 1, & x \geq 0 \end{cases}$

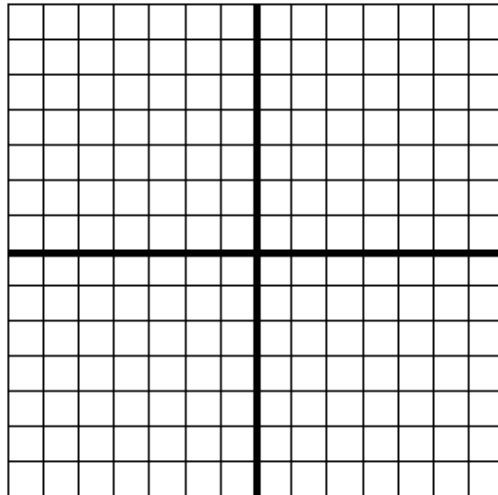


- a. $f(-4)$
c. $f(f(-3))$

- b. $f(0)$
d. $f(f(0))$

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41. $f(x) = \begin{cases} 6 - x, & x \leq 3 \\ \ln x, & x > 3 \end{cases}$



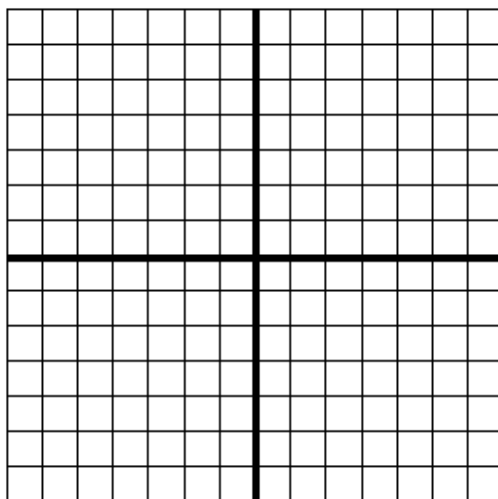
a. $f(3)$

b. $f(5)$

c. $f(f(0))$

d. $f(f(-1))$

42. $f(x) = \begin{cases} \sin x, & x \leq 0 \\ x^3, & x > 0 \end{cases}$



a. $f(-\pi)$

b. $f(2)$

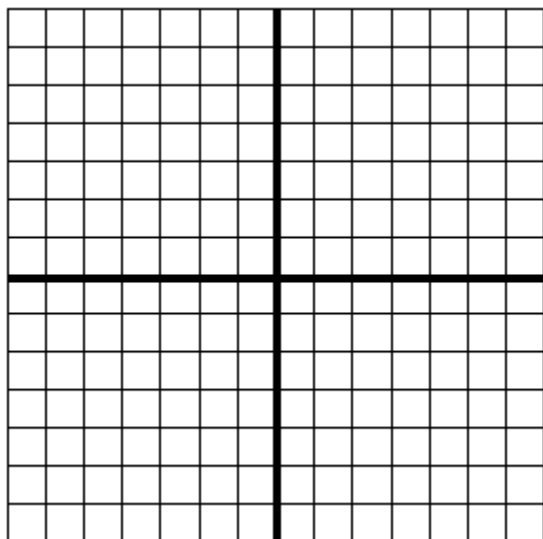
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c. $f\left(f\left(\frac{-3\pi}{2}\right)\right)$

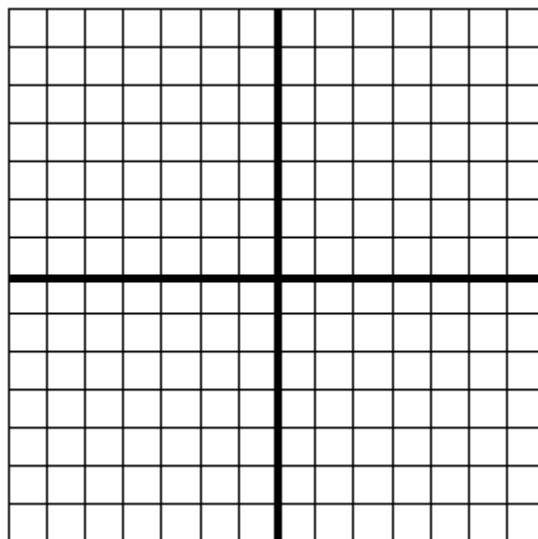
d. $f(f(0))$

Part 10: Function Types: Name the function, find its domain and range, zeroes, and graph it

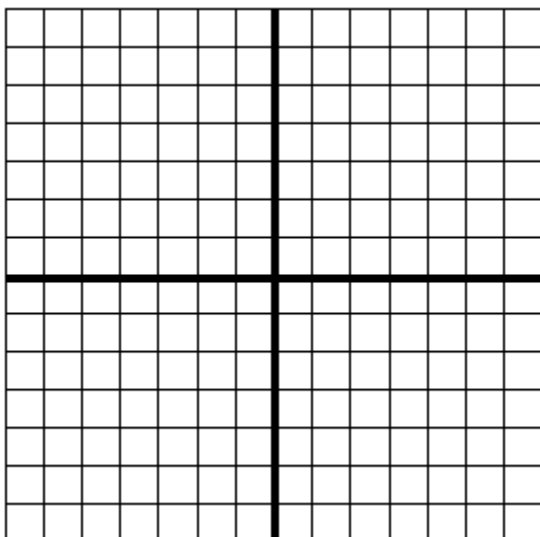
43. $4x - 3y = 6$



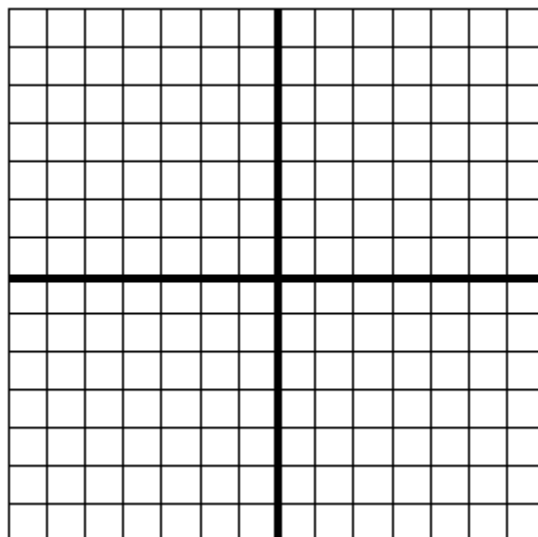
44. $f(x) = x^2 - 2x - 3$



45. $y = x^3 - 8$

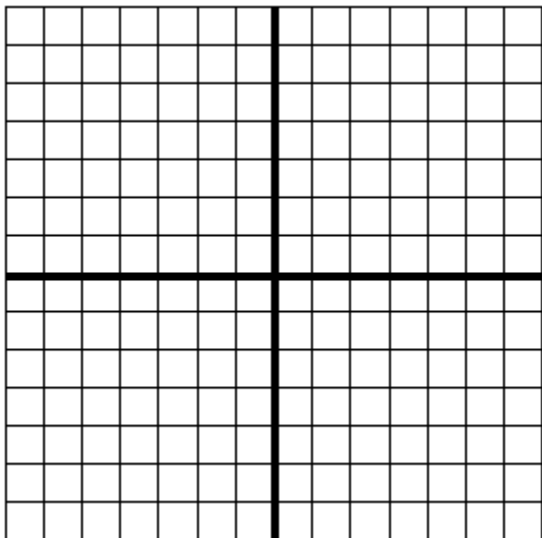


46. $y = 2^x$

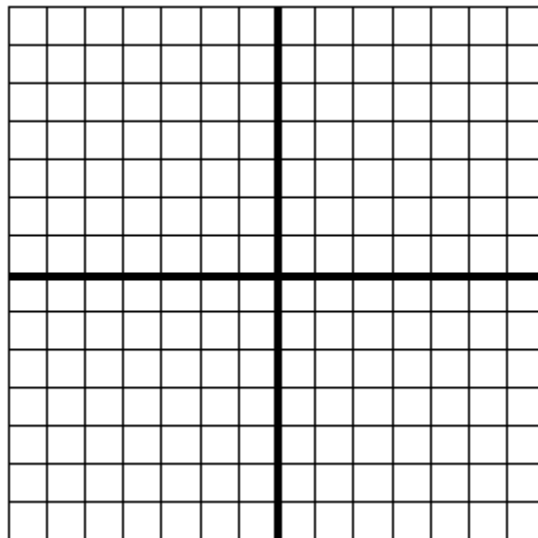


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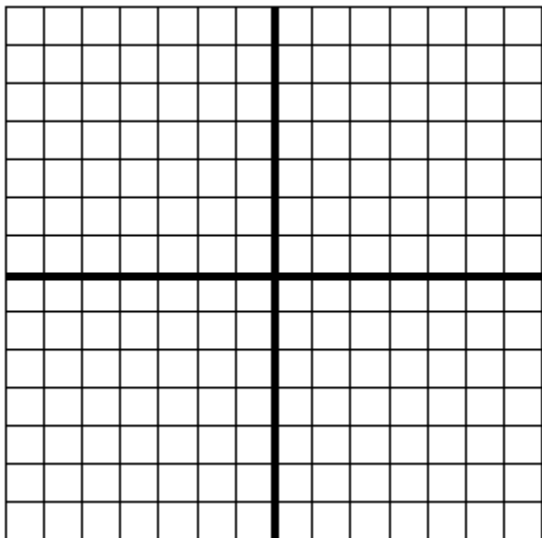
47. $f(x) = \sin x$



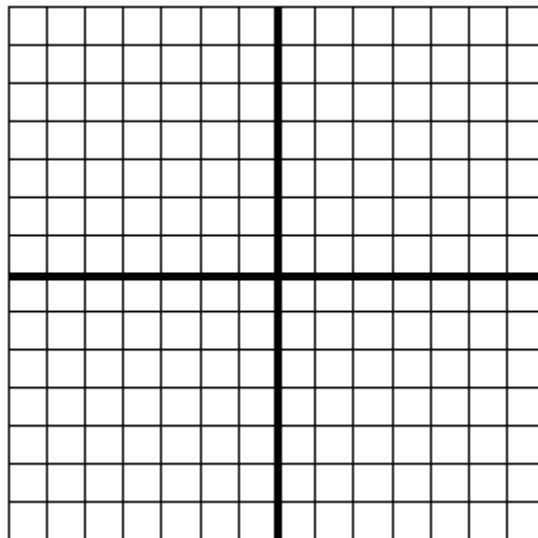
48. $f(x) = \tan x$



49. $f(x) = \sec x$

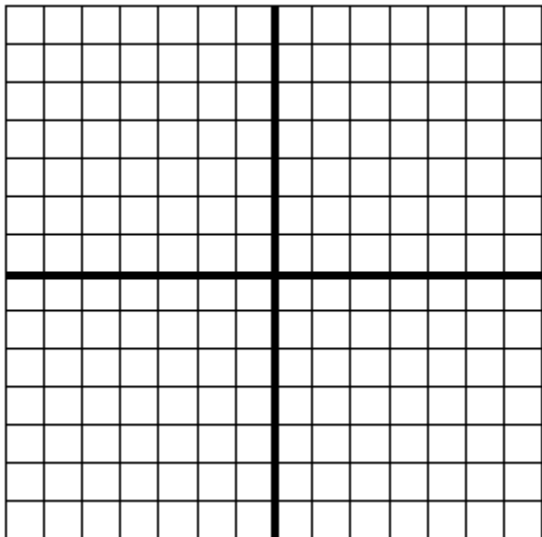


50. $y = \sqrt{x - 3}$

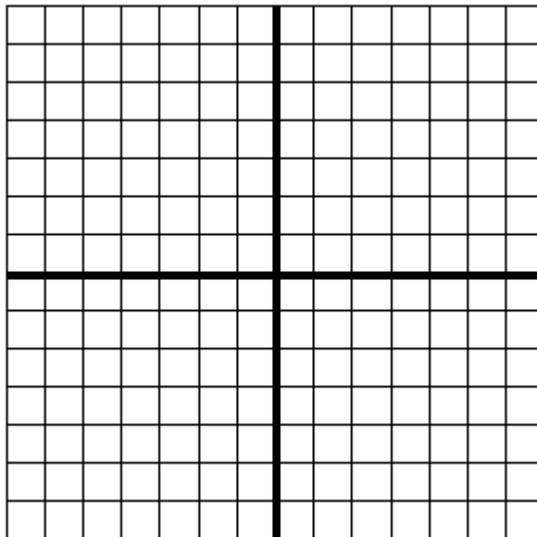


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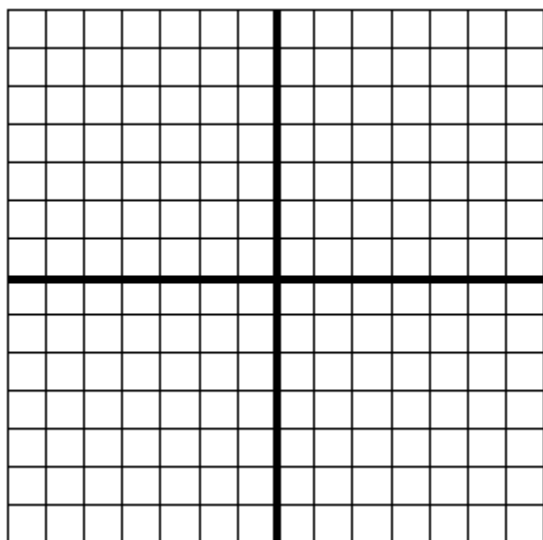
51. $f(x) = \frac{2}{x-3}$



52. $f(x) = e^x + 3$



53. $f(x) = \ln x$

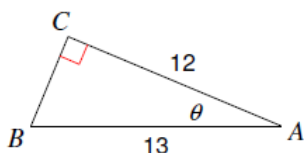


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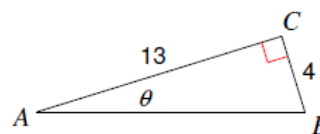
Part 11: Solving problems involving trigonometry

54. Triangles: Solve for the missing side and θ

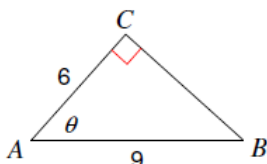
1)



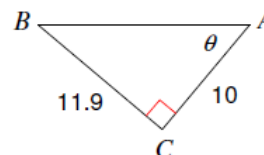
2)



3)



4)



55. Find the equation of a line (in $y = mx + b$ form) through the point $(-2, 5)$ with an angle of inclination of 45° .

56. If $\sin x = \frac{3}{5}$, find $\sin(2x)$.

57. The angle of elevation of the top of a building from a point on the ground 40 feet from the foot of the building is 60° . How tall is the building?

Part 12: Trig Identities: Prove that both sides of each equation are equal to each other

58. $\sin^5 x = (1 - 2\cos^2 x + \cos^4 x) \sin x$

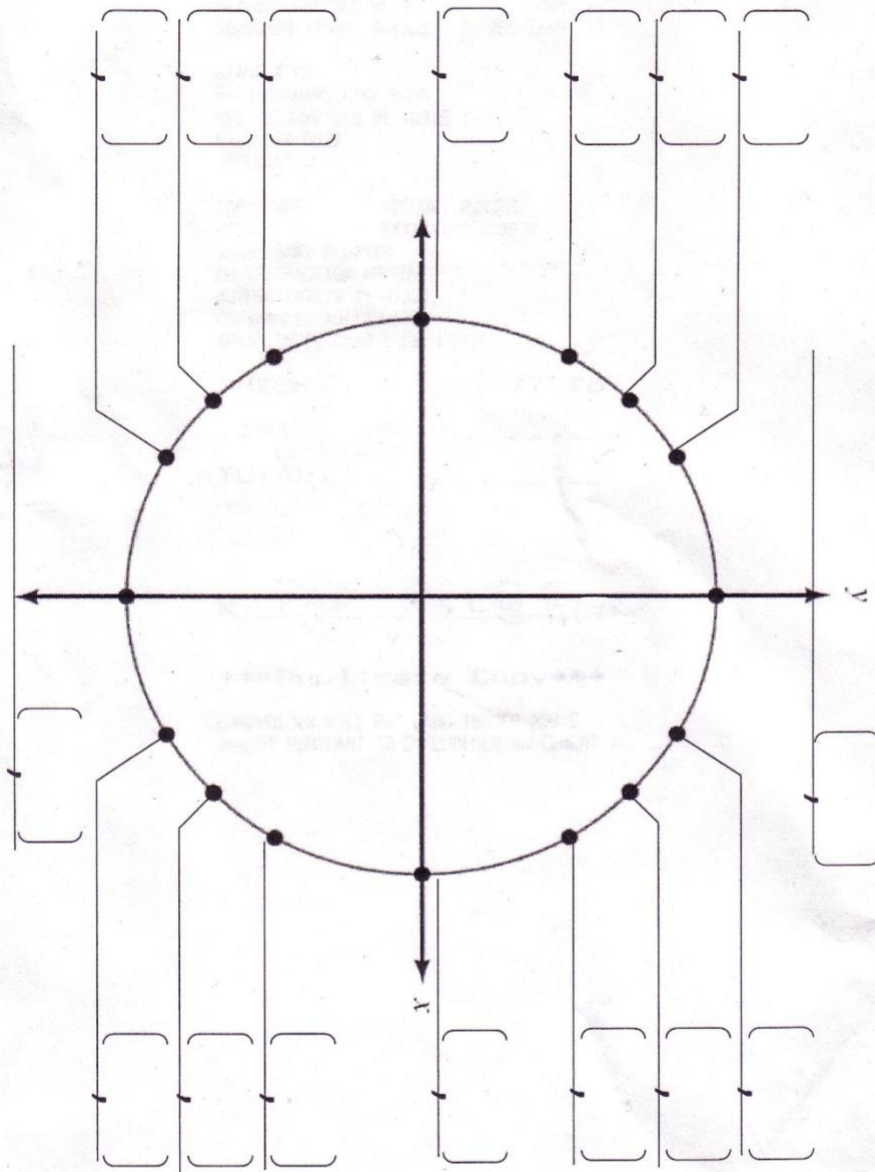
59. $\frac{\cos^2 x}{\sin x} + \sin x = \csc x$

60. $\frac{1}{1-\sin x} + \frac{1}{1+\sin x} = 2\sec^2 x$

61. $\cot x = \frac{1+\cos^2 x}{\sin^2 x}$

Part 13: Unit Circle: Fill in the unit circle; label degrees, radians, $(\cos x, \sin x)$

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Unit Circle
Label degrees, radians, (cos x, sin x)

NAME _____

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Resources:

<http://www.calcchat.com/book/Calculus-9e/>

http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2178.html

<http://www.calculus.org/>

<http://cow.math.temple.edu/>

<http://www.mathsisfun.com/calculus/>

<http://www.wolframalpha.com/widgets/view.jsp?id=dc816cd78d306d7bda61f6facf5f17f7>

<http://www.wolframalpha.com/widgets/view.jsp?id=c44e503833b64e9f27197a484f4257c>