AP Calculus AB

Dear Students and Parents/Guardians,

Welcome to AP Calculus AB! We are thrilled to support your continued journey in mathematics and help prepare you for the exciting challenges of this college-level course. In order to ensure all students are well-prepared for the rigor and pace of AP Calculus AB, a summer assignment has been developed to reinforce critical skills from Algebra 1, Algebra 2, and Precalculus.

This summer packet is designed to strengthen students' understanding of essential prerequisite concepts that will be applied and expanded upon in AP Calculus AB. These foundational topics will not be retaught in the course, as the curriculum is fast-paced and content-rich. Completing the summer assignment will help ensure students are ready to succeed from the very beginning of the school year.

- **Due Date:** The completed summer packet is to be submitted on the **first day of school**.
- **Assessment:** An assessment based on the summer assignment will take place during the **first week of school** to evaluate student readiness. **Students who do not demonstrate proficiency on the initial assessment will be moved to an alternative course that better supports their current level of mathematical development. Our goal is to place each student in an environment where they can grow and thrive academically.**

Academic Integrity – Honor Code

By signing below, both the student and parent/guardian affirm that:

- The summer assignment was completed independently, without the use of artificial intelligence tools or outside assistance other than tutorial videos/websites.
- A calculator was not used.
- The work submitted reflects the student's own understanding and effort.

I, the student, affirm that I have completed this summer assignment honestly and independently. I did not use AI tools or a calculator.

Student Name (Print): _____

Student Signature: _____ Date: _____

I, the parent/guardian, acknowledge that my child has completed this assignment independently and I understand the expectations for AP Calculus AB.

Parent/Guardian Name (Print): _____

Parent/Guardian Signature: _____ Date: _____

We look forward to a challenging and successful year ahead!

Sincerely,
The CCS Mathematics Department

Calculus - SUMMER PACKET

NAME:_____

Summer + Math = (Best Summer Ever)^2

NO CALCULATOR!!!

Given $f(x) = x^2 - 2x + 5$, find the following.

1. $f(-2) =$

2. $f(x+2) =$

3. $f(x+h) =$

Use the graph $f(x)$ to answer the following.

4. $f(0) =$

$f(4) =$

$f(-1) =$

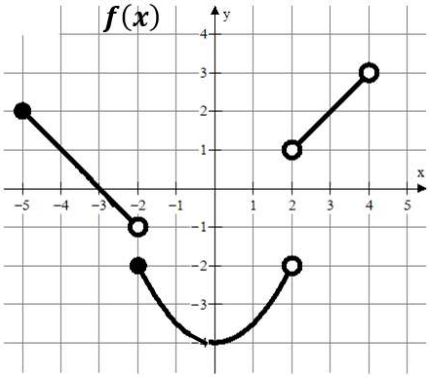
$f(-2) =$

$f(2) =$

$f(3) =$

$f(x) = 2$ when x = ?

$f(x) = -3$ when x = ?



Write the equation of the line meets the following conditions. Use point-slope form.
$y - y_1 = m(x - x_1)$

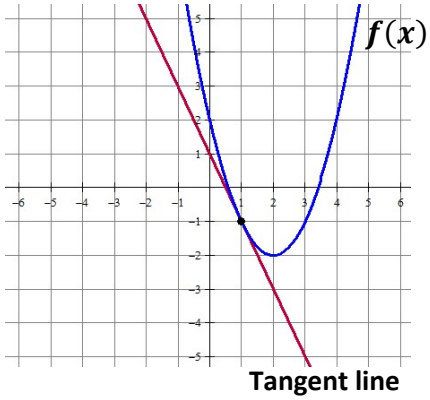
5. slope $= 3$ and $(4, -2)$

6. $m = -\frac{3}{2}$ and $f(-5) = 7$

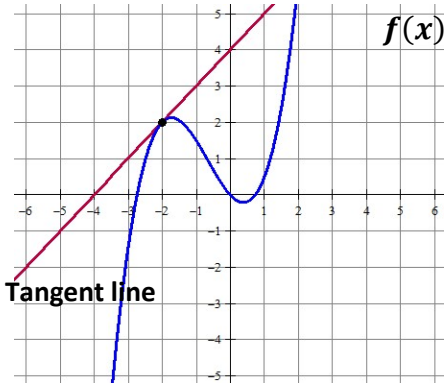
7. $f(4) = -8$ and $f(-3) = 12$

Write the equation of the tangent line in point slope form. $y - y_1 = m(x - x_1)$

8. The line tangent to $f(x)$ at $x = 1$

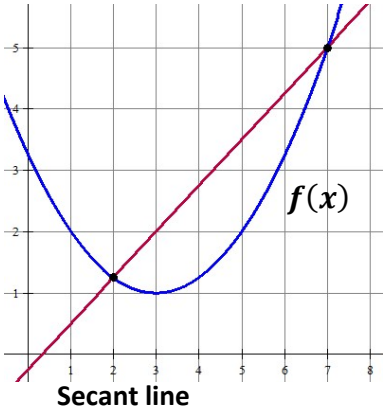


9. The line tangent to $f(x)$ at $x = -2$



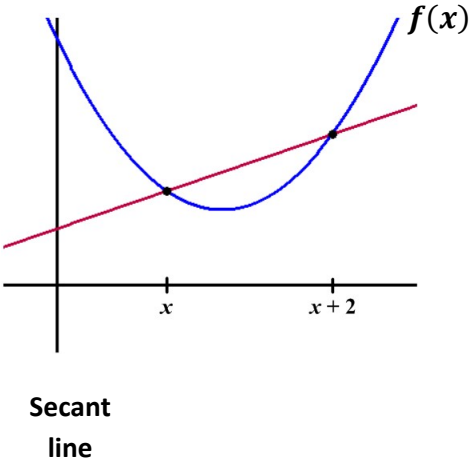
MULTIPLE CHOICE! Remember slope $= \frac{y_2 - y_1}{x_2 - x_1}$

10. Which choice represents the slope of the secant line shown?



A) $\frac{7-2}{f(7)-f(2)}$ B) $\frac{f(7)-2}{7-f(2)}$ C) $\frac{7-f(2)}{f(7)-2}$ D) $\frac{f(7)-f(2)}{7-2}$

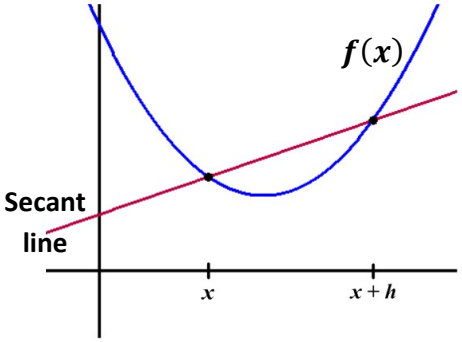
11. Which choice represents the slope of the secant line shown?



A) $\frac{f(x)-f(x+2)}{x+2-x}$ B) $\frac{f(x+2)-f(x)}{x+2-x}$ C) $\frac{f(x+2)-f(x)}{x-(x+2)}$

D) $\frac{x+2-x}{f(x)-f(x+2)}$

12. Which choice represents the slope of the secant line shown?



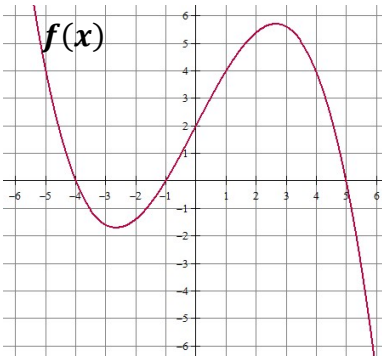
A) $\frac{f(x+h)-f(x)}{x-(x+h)}$ B) $\frac{x-(x+h)}{f(x+h)-f(x)}$ C) $\frac{f(x+h)-f(x)}{x+h-x}$

D) $\frac{f(x)-f(x+h)}{x+h-x}$

13. Which of the following statements about the function $f(x)$ is true?

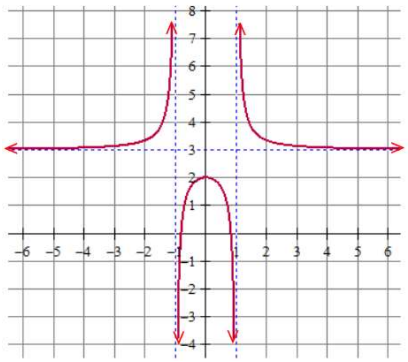
I. $f(2) = 0$
II. $(x + 4)$ is a factor of $f(x)$
III. $f(5) = f(-1)$

(A) I only
(B) II only
(C) III only
(D) I and III only
(E) II and III only



Find the domain and range (express in interval notation). Find all horizontal and vertical asymptotes.

14.



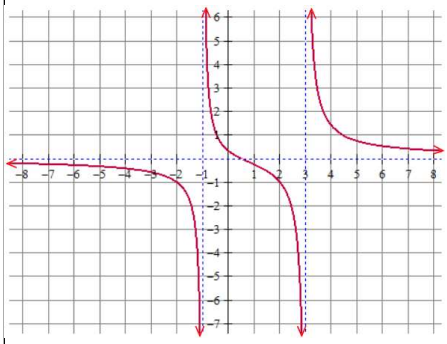
Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

15.



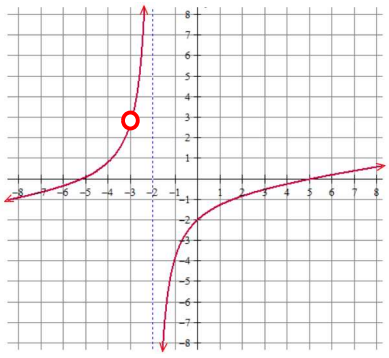
Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

16.



Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

MULTIPLE CHOICE!

17. Which of the following functions has a vertical asymptote at $x = 4$?

(A) $\frac{x+5}{x^2-4}$

(B) $\frac{x^2-16}{x-4}$

(C) $\frac{4x}{x+1}$

(D) $\frac{x+6}{x^2-7x+12}$

(E) None of the above

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18. Consider the function: $(x) = \frac{x^2-5x+6}{x^2-4}$. Which of the following statements is true?

I. $f(x)$ has a vertical asymptote of $x = 2$
II. $f(x)$ has a vertical asymptote of $x = -2$
III. $f(x)$ has a horizontal asymptote of $y = 1$

(A) I only

(B) II only

(C) I and III only

(D) II and III only

(E) I, II and III

Rewrite the following using rational exponents. Example: $\frac{1}{\sqrt[3]{x^2}} = x^{-\frac{2}{3}}$

19. $\sqrt[5]{x^3} + \sqrt[5]{2x}$	20. $\sqrt{x+1}$	21. $\frac{1}{\sqrt{x+1}}$
22. $\frac{1}{\sqrt{x}} - \frac{2}{x}$	23. $\frac{1}{4x^3} + \frac{1}{2}\sqrt[4]{x^3}$	24. $\frac{1}{4\sqrt{x}} - 2\sqrt{x+1}$

Write each expression in radical form and positive exponents. Example: $x^{-\frac{2}{3}} + x^{-2} = \frac{1}{\sqrt[3]{x^2}} + \frac{1}{x^2}$

25. $x^{-\frac{1}{2}} - x^{\frac{3}{2}}$	26. $\frac{1}{2}x^{-\frac{1}{2}} + x^{-1}$	27. $3x^{-\frac{1}{2}}$
28. $(x+4)^{-\frac{1}{2}}$	29. $x^{-2} + x^{\frac{1}{2}}$	30. $2x^{-2} + \frac{3}{2}x^{-1}$

Need to know basic trig functions in RADIANS! We never use degrees. You can either use the Unit Circle or Special Triangles to find the following.

31. $\sin\frac{\pi}{6}$	32. $\cos\frac{\pi}{4}$	33. $\sin 2\pi$
34. $\tan\pi$	35. $\sec\frac{\pi}{2}$	36. $\cos\frac{\pi}{6}$
37. $\sin\frac{\pi}{3}$	38. $\sin\frac{3\pi}{2}$	39. $\tan\frac{\pi}{4}$
40. $\csc\frac{\pi}{2}$	41. $\sin\pi$	42. $\cos\frac{\pi}{3}$
43. Find x where $0 \le x \le 2\pi$, $\sin x = \frac{1}{2}$	44. Find x where $0 \le x \le 2\pi$, $\tan x = 0$	45. Find x where $0 \le x \le 2\pi$, $\cos x = -1$

Solve the following equations. Remember $e^0 = 1$ and $\ln 1 = 0$.

46. $e^x + 1 = 2$	47. $3e^x + 5 = 8$	48. $e^{2x} = 1$
49. $\ln x = 0$	50. $3 - \ln x = 3$	51. $\ln(3x) = 0$
52. $x^2 - 3x = 0$	53. $e^x + xe^x = 0$	54. $e^{2x} - e^x = 0$

Solve the following trig equations where $0 \leq x \leq 2\pi$.

55. $\sin x = \frac{1}{2}$	56. $\cos x = -1$	57. $\cos x = \frac{\sqrt{3}}{2}$
58. $2\sin x = -1$	59. $\cos x = \frac{\sqrt{2}}{2}$	60. $\cos\left(\frac{x}{2}\right) = \frac{\sqrt{3}}{2}$
61. $\tan x = 0$	62. $\sin(2x) = 1$	63. $\sin\left(\frac{x}{4}\right) = \frac{\sqrt{3}}{2}$

For each function, determine its domain and range.

Function	Domain	Range
64. $y = \sqrt{x-4}$		
65. $y = (x-3)^2$		
66. $y = \ln x$		
67. $y = e^x$		
68. $y = \sqrt{4-x^2}$		

Simplify.

69. $\frac{\sqrt{x}}{x}$	70. $e^{\ln x}$	71. $e^{1+\ln x}$

72. $\ln 1$

73. $\ln e^7$

74. $\log_3 \frac{1}{3}$

75. $\log_{1/2} 8$

76. $\ln \frac{1}{2}$

77. $27^{\frac{2}{3}}$

78. $\left(5a^{2/3}\right)\left(4a^{3/2}\right)$

79. $\frac{4xy^{-2}}{12x^{-\frac{1}{3}}y^{-5}}$

80. $\left(4a^{5/3}\right)^{3/2}$

If $f(x) = \{(3,5),(2,4),(1,7)\}$ $g(x) = \sqrt{x-3}$, then determine each of the following.
$h(x) = \{(3,2),(4,3),(1,6)\}$ $k(x) = x^2 + 5$

81. $(f+h)(1)$

82. $(k-g)(5)$

83. $f\big(h(3)\big)$

84. $g\big(k(7)\big)$

85. $h(3)$

86. $g\big(g(9)\big)$

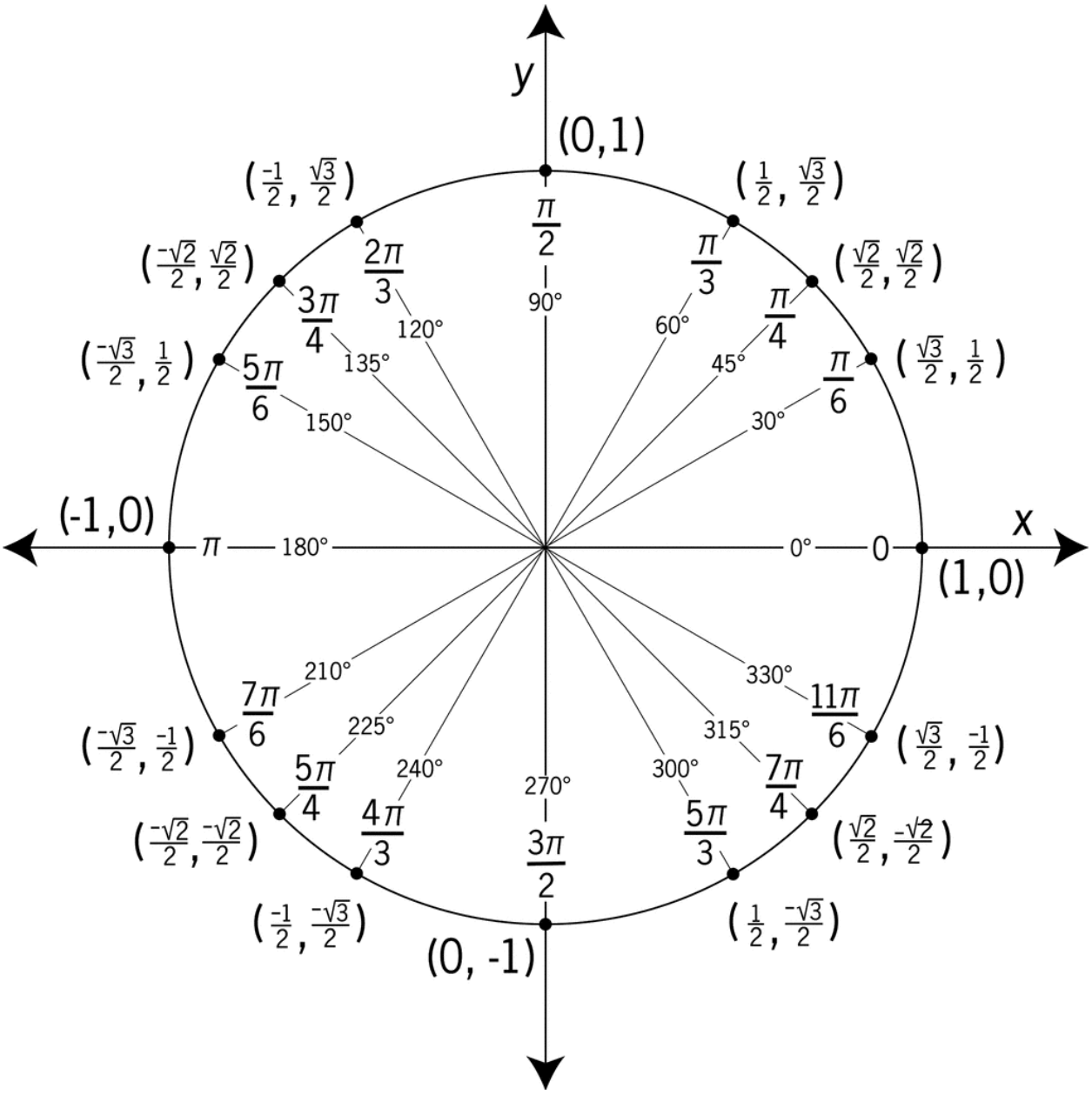
87. $f^{-1}(4)$

88. $k^{-1}(x)$

89. $k\big(g(x)\big)$

90. $g(f(2))$

Must COMPLETELY memorize every part of the unit circle. Test on first day of class.
Add 360° and 2∏ to under 0° and 0.



AP Calc Summer Math Solutions (ODDS)

1) 13

3) $x^2+2xh+h^2-2x-2h+5$

5) $y+2=3(x-4)$

7) $y-12=\frac{-20}{7}(x+3)$ OR $y+8=-\frac{20}{7}(x-4)$

9) $y-2=(x+2)$

11) B

13) E

15) Domain: $(-\infty,-1)\cup(-1,3)\cup(3,\infty)$
Range: $(-\infty,\infty)$
HA: $y=0$
VA: $x=-1$, $x=3$

17) D

19) $x^{\frac{3}{5}}+(2x)^{\frac{1}{5}}$

21) $(x+1)^{-1/2}$

23) $\frac{1}{4}x^{-3}+\frac{1}{2}x^{3/4}$

25) $\frac{1}{\sqrt{x}}-\sqrt{x^3}$

27) $\frac{3}{\sqrt{x}}$

29) $\frac{1}{x^2}+\sqrt{x}$

31) $1/2$
33) 0
35) undefined
37) $\frac{\sqrt{3}}{2}$
39) 1
41) 0
43) $\frac{\pi}{6}$ and $\frac{5\pi}{6}$

45) π
47) $x=0$
49) $x=1$
51) $x=\frac{1}{3}$
53) $x=-1$
55) $x=\pi/6$ and $5\pi/6$
57) $x=\frac{\pi}{6}$ and $\frac{11\pi}{6}$

59) $x=\frac{\pi}{4}$ and $\frac{7\pi}{4}$

61) $x=0, \pi, 2\pi$

63) $x=\frac{4\pi}{3}$ and $\frac{8\pi}{3}$

65) Dom: $\mathbb{R}$ $(-\infty,\infty)$ Range: $y\geq 0$ $[0,\infty)$

67) Dom: $\mathbb{R}$ $(-\infty,\infty)$ Range: $y>0$ $(0,\infty)$

69) $\frac{1}{\sqrt{x}}$

71) eX

73) 7
75) -3
77) 9
79) $\frac{1}{3}x^{4/3}y^3$

81) 13
83) 4
85) 2
87) 2
89) $x+2$