

# AP Calculus AB



**Directions:**

1. This packet is to be handed in to your AP Calculus teacher on the first day of school.
2. All work must be shown on the packet OR on notebook paper attached to the packet.
3. A test on the unit circle will be given on the first day of school.

**Answers to the odd problems can be found at the end of the packet. No work = no credit.**

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Name: \_\_\_\_\_

# Calculus - SUMMER PACKET

NAME: \_\_\_\_\_

Summer + Math = (Best Summer Ever)<sup>2</sup>

## 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.  $f(0) =$

$f(4) =$

$f(-1) =$

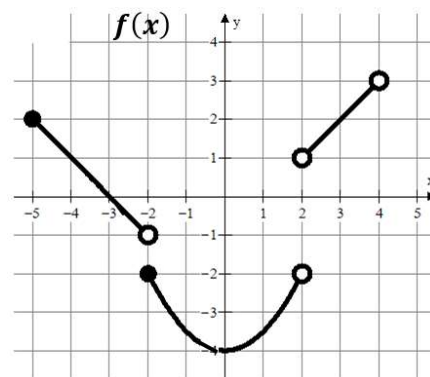
$f(-2) =$

$f(2) =$

$f(3) =$

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

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



Write the equation of the line meets the following conditions. Use point-slope form.

$y - y_1 = m(x - x_1)$

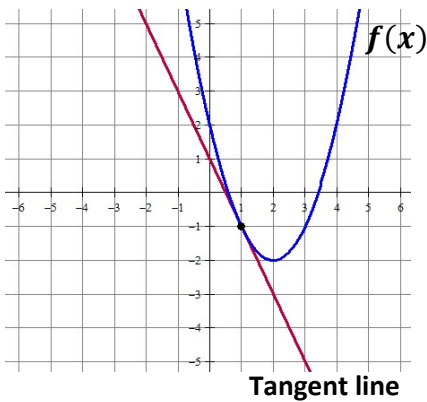
5. slope = 3 and  $(4, -2)$

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

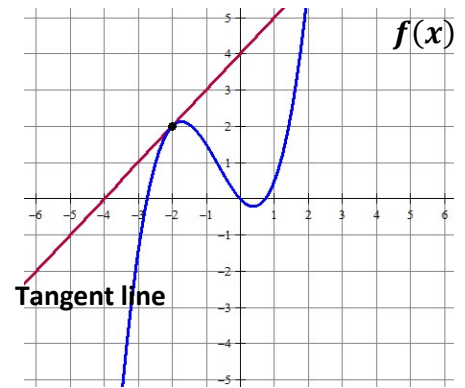
7.  $f(4) = -8$  and  $f(-3) = 12$

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  $x = 1$



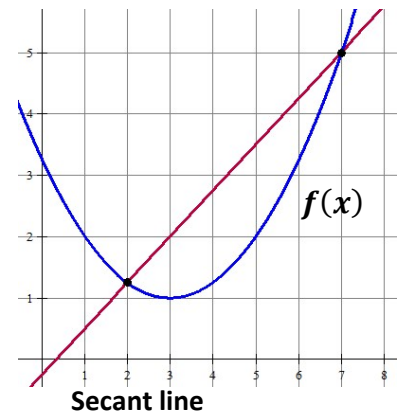
9. The line tangent to  $f(x)$  at  $x = -2$



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

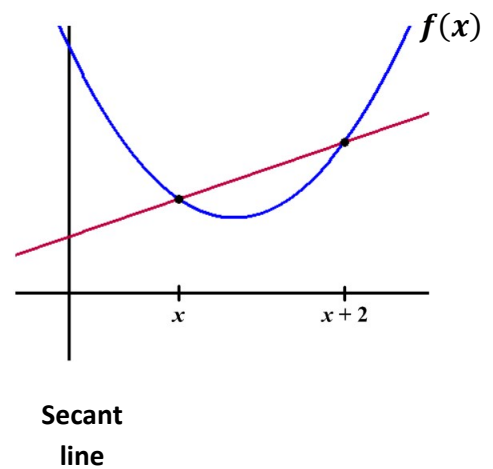
10. Which choice represents the slope of the secant line shown?

- 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)  $\frac{f(7)-f(2)}{7-2}$



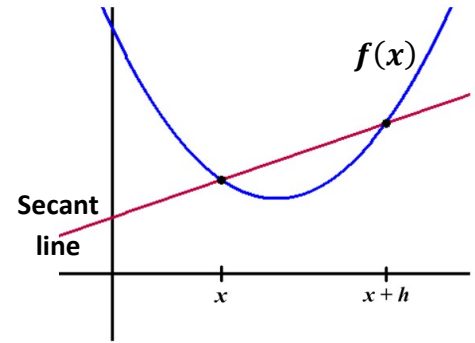
11. Which choice represents the slope of the secant line shown?

- 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?

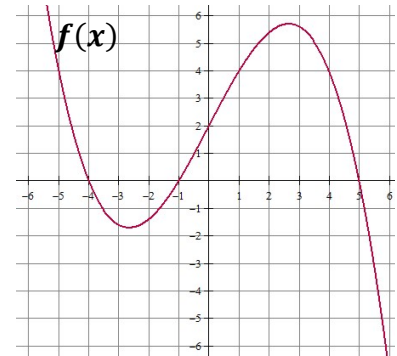
- A)  $\frac{f(x+h)-f(x)}{x-(x+h)}$       B)  $\frac{x-(x+h)}{f(x+h)-f(x)}$       C)  $\frac{f(x+h)-f(x)}{x+h-x}$
- D)  $\frac{f(x)-f(x+h)}{x+h-x}$



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

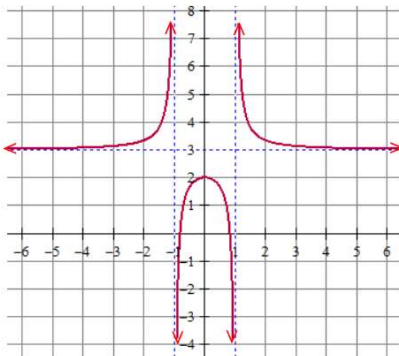
- I.  $f(2) = 0$   
 II.  $(x + 4)$  is a factor of  $f(x)$   
 III.  $f(5) = f(-1)$

- (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.



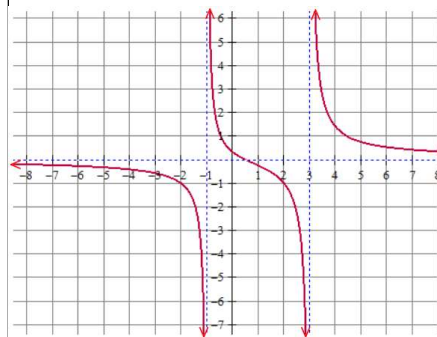
Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

15.



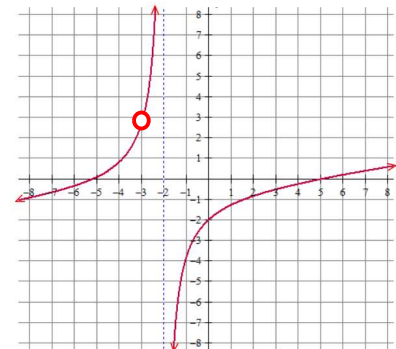
Domain:

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

18. Consider the function:  $f(x) = \frac{x^2-5x+6}{x^2-4}$ . 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 $0 \leq x \leq 2\pi$ , $\sin x = \frac{1}{2}$	44. Find $x$ where $0 \leq x \leq 2\pi$ , $\tan x = 0$	45. Find $x$ where $0 \leq x \leq 2\pi$ , $\cos x = -1$

**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.  $(5a^{2/3})(4a^{3/2})$

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

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

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.  $f(h(3))$

84.  $g(k(7))$

85.  $h(3)$

86.  $g(g(9))$

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

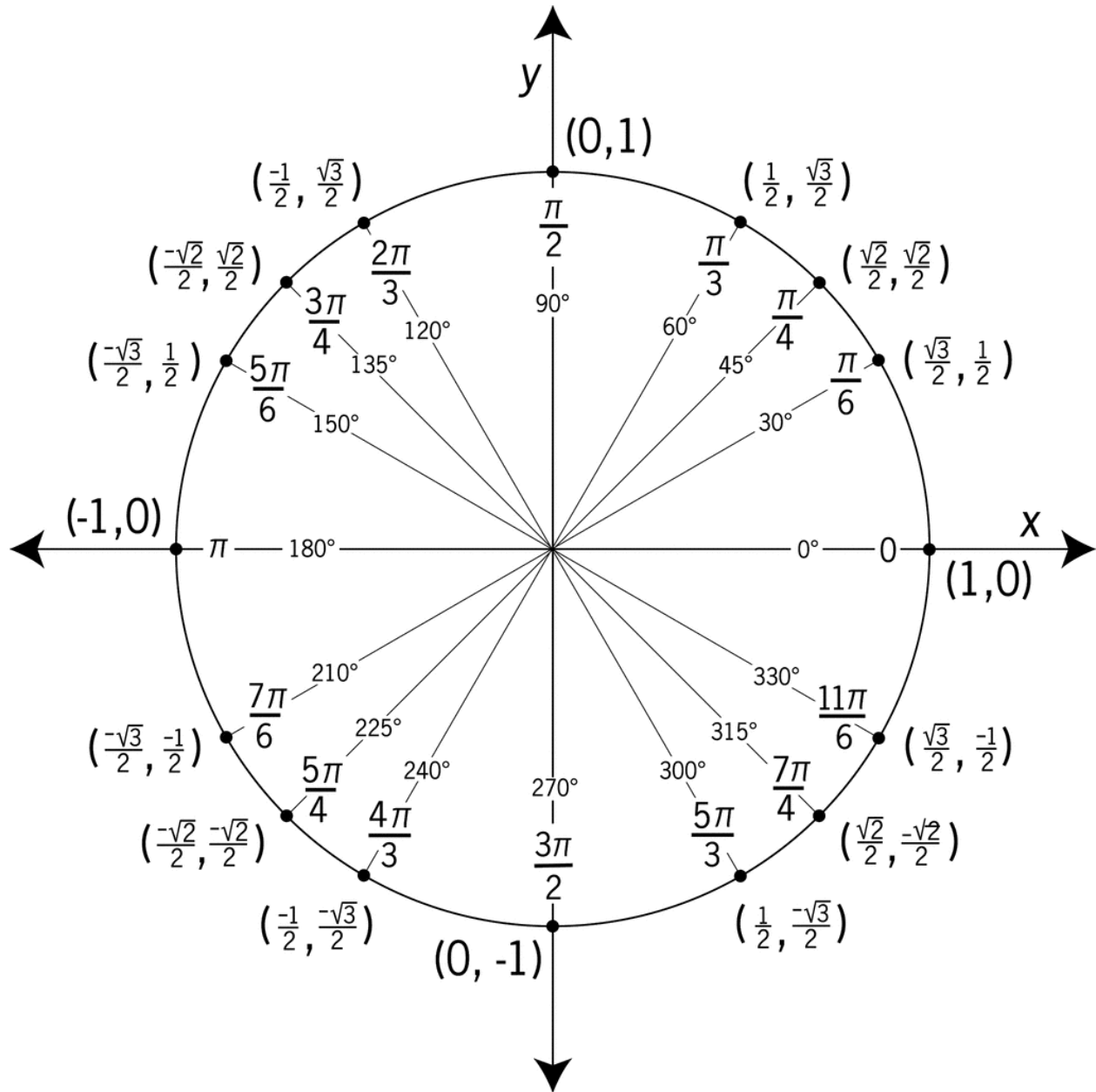
88.  $k^{-1}(x)$

89.  $k(g(x))$

90.  $g(f(2))$



Must COMPLETELY memorize every part of the unit circle. Test on first day of class.  
Add  $360^\circ$  and  $2\pi$  to under  $0^\circ$  and  $0$ .



# AP Calc Summer Math Solutions (ODDS)

1) B

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)  $(x + 1)^{-\frac{1}{2}}$

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

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

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

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

$$31) \frac{1}{2}$$

$$33) 0$$

35) undefined

$$37) \frac{\sqrt{3}}{2}$$

$$39) 1$$

$$41) 0$$

$$43) \frac{\pi}{6} \text{ and } \frac{5\pi}{6}$$

$$45) \pi$$

$$47) x=0$$

$$49) x=1$$

$$51) x = \frac{1}{3}$$

$$53) x=-1$$

$$55) x = \frac{\pi}{6} \text{ and } \frac{5\pi}{6}$$

$$57) x = \frac{\pi}{6} \text{ and } \frac{11\pi}{6}$$

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

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

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

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

$(-\infty, \infty)$

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

$(-\infty, \infty)$

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

$$71) e^x$$

$$73) 7$$

$$75) -3$$

$$77) 9$$

$$79) \frac{1}{3} x^{4/3} y^3$$

$$81) 13$$

$$83) 4$$

$$85) 2$$

$$87) 2$$

$$89) x+2$$