

AP Calculus

Summer

Assignment

2018-2019

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Remind 101

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2016-2017

P. CALCULUS AB SUMMER  ASSIGNMENT Name _____

Due the first day of class.

Simplify the following expressions: Remember to factor the numerator and denominator 1st.

1. $\frac{2x^2-5x-3}{x^2-9}$

2. $\frac{x^2-5x}{x^2-x-20}$

3. $\frac{(x+h)^2-x^2}{h}$

4. $\frac{5(x+h)^3-5x^3}{h}$

5. $\frac{(x-1)^2(3x-1)-6(x-1)}{(x-1)^4}$

6. $\frac{2x(x+1)^2-3(x+1)^3}{8x^3+14x^2+6x}$

*7. $\frac{\sqrt{u}+\sqrt[3]{u+1}}{\sqrt{u}}$

*8. $\frac{6x^3-2\sqrt{x}-4}{\sqrt{4x}}$

*9. $\frac{\frac{a}{b}-a}{a+(\frac{a}{b})^2}$

*10. $\frac{\frac{1}{x+2}-\frac{1}{2}}{x}$



11. Evaluate $f(9)$ for the function given by

$f(x) = \frac{\sqrt{x-5}-2}{x-9}$ *Hint: Conjugate

12. Evaluate $h(2)$ for the function given by

$h(x) = \frac{\frac{1}{x} - \frac{1}{2}}{x-2}$ *Hint: common denominator.

Solve for x: (use calculator to check your answer) *Hint :zero's

13. $\frac{3x+5}{(x-1)(x^2+7)}=0$

14. $(2x + 1)(x - 1)^2 + (x + 5)(2x + 1)^2 = 0$

15. $\sqrt[3]{x+1} - 4 = -1$

16. $\ln x(x^2 - 3x - 4) + \ln x(x^2 - 9x + 20) = 0$

17. $x^3 + 27 = 0$ *Pascal Triangle

*18. $xy_1 + xy_1y^2 - 3 = 5y_1 + xy$
(solve for y_1)

19. Write the equation of a line with a slope of 5, passing through (3,-4)

20. Write the equation of a line passing through (4, 1) and (3,-2)

~~21. Write the equation of a line passing through the origin and perpendicular~~
to $3x + 4y = -7$.

22. Write the equation of a line passing through (-2, 1) and
parallel to the line $4x + 2y = -1$.

23. Use the table to the right to answer the following questions

a. $g(f(3))$

b. $f(g(3))$

c. $f(f(3))$

d. $f^{-1}(5)$

e. $g^{-1}(4)$

f. $g^{-1}(f^{-1}(1))$

g. $g(f^{-1}(1))$

X	f(x)	g(x)
1	4	3
2	3	5
3	5	2
4	2	1
5	1	4

Given that $h(x) = -3f(x+1) - 2g(x) + 3x - 6$, find $h(2)$.

24. The graph of $f(x)$ is shown below to the right. The graph is tangent to the x-axis at $x = -3$, has a zero at $x = 3$ and a relative minimum at $x = 1$. Using the graph of $f(x)$

a. Write a transformation of $f(x)$ that will result in a relative minimum value at $(5, -35)$

b. What is the minimum value of the function over the interval $[-4, 4]$?

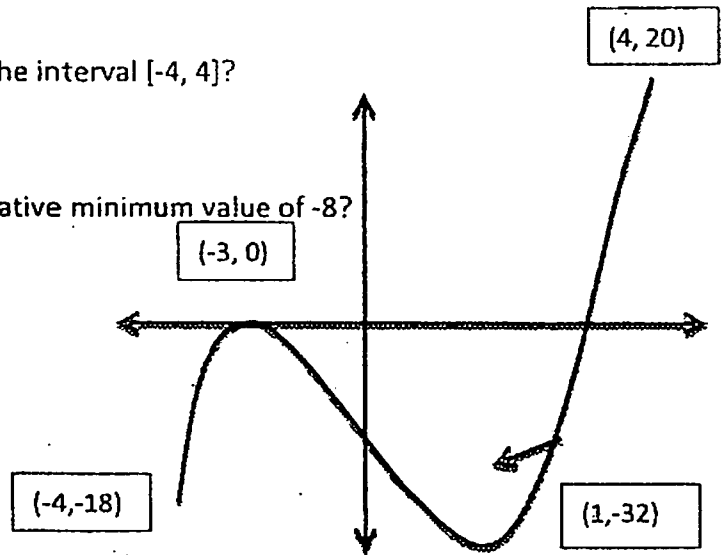
c. Which of the following equations would have a relative minimum value of -8 ?

$$g(x) = \frac{1}{4}f(x)$$

$$h(x) = -f(x-4) - 8$$

$$m(x) = f(x) - 8$$

$$k(x) = f(x) + 24$$



d. Which of the following equations would have no real zeros? Briefly sketch the graph of each

$$f(|x|) + 2$$

$$f(x) + 33$$

$$|f(x)| + 2$$

$$-f(x) + 33$$

$$f(x+3) + 33$$

25. If $f(x) = \sqrt{x^3} - 1$, find the solution to the equation $f(x) = f^{-1}(x)$ (Calculator Use Permitted)

26. Let $f(x)$ be the function described below. Sketch $f(x)$ and rewrite the function in terms of an absolute value

$$\text{expression } f(x) = \begin{cases} 2x + 5 & x < 0 \\ -2x + 5 & x \geq 0 \end{cases}$$

27. Let $h(x)$ be the function $h(x) = \begin{cases} x^2 - 4x + 3 & x < 3 \\ 2x - 9 & x \geq 3 \end{cases}$

a. Sketch $h(x)$ in the space to the right.

b. What is the minimum value of $h(x)$?

b. For what values of x is $h(x) = 8$?

28. Let $f(x) = -|x+3| - 2$

a. Sketch $f(x)$

b. Domain of $f(x)$: _____

Range of $f(x)$: _____

d. Find $f(3) =$ _____

Find $f^{-1}(3) =$ _____

f. Rewrite $f(x)$ as a piecewise function

29. Let $g(x) = \begin{cases} \frac{x}{2} & x \geq 4 \\ \sqrt{x} & 0 < x < 4 \\ x^2 & x < 0 \end{cases}$

a. Sketch $g(x)$ in the space to the right.

b. $g(-3) =$ _____

$g(1) =$ _____

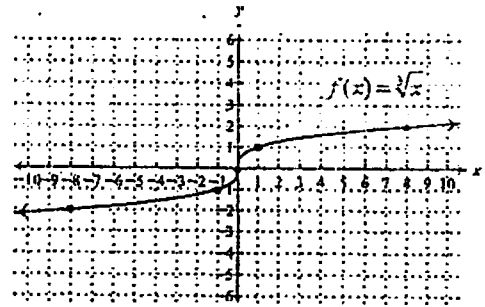
$g(0) =$ _____

Is $g(x)$ continuous at $x = 4$?

30. Given the graph of $g(x)$ on the right

a. Estimate the average rate of change of the graph from $[0,6]$

Hint: $\frac{g(6)-g(0)}{6-0}$



b. The average rate of change in part (a) is the slope of the secant line over the interval $[0,6]$. Sketch this secant line onto the graph.

c. Estimate the slope of the graph at the point $(0,0)$ by drawing a tangent line. Is the tangent line more or less steep than the secant line over the interval?

d. Estimate the slope of the graph at the point $(6,2)$ by drawing a tangent line. Is the tangent line more or less steep than the secant line over the interval?

31. $Q(x) = \frac{3x}{x+1}$

a. Where is the function discontinuous?

b. Write an equation for any vertical asymptote(s).

c. Write an equation for any horizontal asymptote(s).

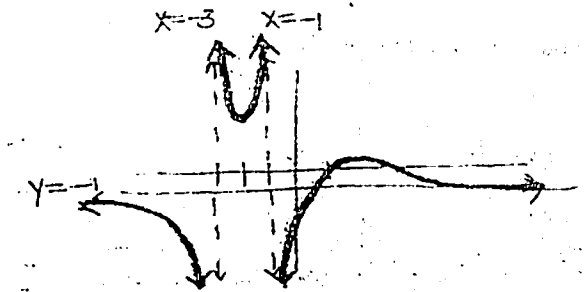
32. $Q(x) = \frac{-x^2+4x+5}{2x^2+6x+4}$

a. Where is the function discontinuous?

b. Write an equation for any vertical asymptote(s).

c. Write an equation for any horizontal asymptote(s).

Write an equation of the function shown to the right if:
 There are vertical asymptotes at $x = -3$ and $x = -1$,
 There is a horizontal asymptote at $y = -1$
 There is an x-intercept of at $x = 1$.



34. Which of the following statements are true, considering the function, $h(x) = \frac{(ax-2)(x+b)}{(x+b)(x-c)}$

- I. The function $h(x)$ has a vertical asymptote at $x = c$.
- II. The function has a vertical asymptote at $x = -b$.
- III. The function has a horizontal asymptote at $y = a$.

35. Consider the function $g(x) = \frac{3x^3 + 4x^2 - x - 2}{x^2 - x - 2}$

- a. Identify any domain restrictions. Do either of these restrictions result from a vertical asymptote?
 [Hint: Vertical Asymptotes only occur where UNIQUE factors of the denominator are equal to zero.
 Factor the denominator and use either polynomial long division or synthetic division to see if either of the factors in the denominator is repeated in the numerator]

36. Let $f(x) = \frac{x^2 - a}{b(x-c)(x-d)}$ Find the values of constants a , b , c and d such that $f(x)$ has x-intercepts at $(4,0)$ and $(-4,0)$, $f(x)$ has vertical asymptotes at $x = 9$ and $x = -2$, and a horizontal asymptote at $y = \frac{1}{3}$

37. Sketch the graphs of $y = e^x$ and $y = \ln(x)$. Then solve for the value of x in the following:

a. $\log_2 16 = x$

b. $\log_3 1 = x$

c. $\log 10 = x$

d. $\ln 1 = x$

e. $\ln e = x$

f. $\ln(e^3)$

g. $\ln \sqrt{4e} = x$

h. $e^{3x} = 0$

i. $e^{3\ln x^2} = 64$

38. Let $f(x)$ be the function defined by $f(x) = 3^x$,

a. Find $f^{-1}(x)$

b. What is $f(b+3)$?

39. Which of the following would be equivalent to $\frac{5}{2} \ln(4x^2)$ for $x > 0$?

I. $\ln 2 + \ln x$

II. $\ln 32 + \ln x^5$

III. $5[\ln 2 + \ln x]$

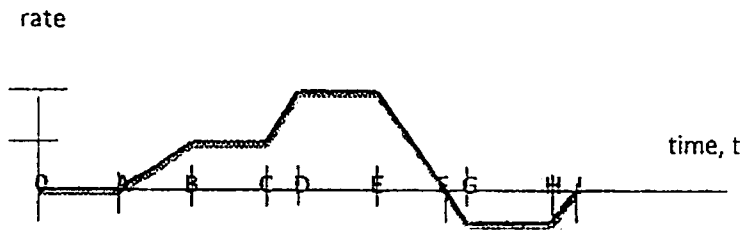
40. The rate at which water is filling and draining from a tank ($t > 0$) is represented by the graph below. A positive rate means that water is entering the tank, while a negative rate means that the water is leaving the tank. State the interval(s) on which each of the following is true...

a. The Volume of the water is constant.

b. The Volume of the water is increasing.

c. The Volume of the water is decreasing.

d. The Volume of the water is increasing the fastest.



41. A swimming pool can hold a maximum of 360 gallons of water. The full pool develops a leak and is losing water at a constant rate. After 3 hours, the pool has 354 gallons of water in it.

a. Write a function for $g(t)$, the total number of gallons of water in the pool that is written in terms of t , the amount of time measured in hours that the leak developed.

Find $g(20)$. Explain the meaning of the answer in correct units.

c. If the leak is fixed after 20 hours and the owner immediately begins to refill the pool at a rate of 4 gallons of water per hour, write a piecewise function for $p(t)$, the total number of gallons of water that is in the pool for any time t , measured in hours.

42. Consider the curve $x^2 + 4y^2 = 7 + 3xy$. The slope of the curve at any point on the graph, (x,y) can be found using

$$m = \frac{3y-2x}{8y-3x}$$

Find the point on the graph at which the slope of the graph is zero.

(Hint: 1) set numerator of slope = 0 2) Solve for relationship between x and y 3) substitute the relationship from part 2 into the original equation 4) Use the original function to complete the ordered pair 5) Check for extraneous solutions

43. Consider the curve $3y^2 = x + 2y - 12$. The slope of the curve at any point on the graph, (x, y) can be found using

$$m = \frac{1}{6y+2}$$

Find the point on the graph at which the slope of the graph is undefined.

{Hint: 1) set denominator of slope = 0 2) Solve for value of y 3) Use the original function to complete the ordered pair

5) Check for extraneous solutions}

TRIGONOMETRY REVIEW: You may use the UNIT CIRCLE to evaluate the following.

47. Evaluate without the use of a calculator the following trig values:

a. $\sin \frac{\pi}{6} =$ _____

b. $\cos \frac{\pi}{6} =$ _____

c. $\tan \frac{\pi}{6} =$ _____

d. $\cos \frac{-\pi}{3} =$ _____

e. $\sin \frac{2\pi}{3} =$ _____

f. $\sin(\pi) =$ _____

g. $\sin \frac{3\pi}{2} =$ _____

h. $\cos \frac{6\pi}{4} =$ _____

i. $\cot \frac{\pi}{6} =$ _____

44. Evaluate without the use of a calculator the following inverse trig values for $0 \leq x \leq 2\pi$.

{Hint: you are looking at EACH ANGLE MEASURED IN RADIANS that will produce the (VALUE) of the trig function- there may be multiple angles on the listed interval}**Some inverse trig functions may have multiple solutions for

$$0 \leq x \leq 2\pi^{**}$$

a. $\sin^{-1}(1) =$ _____

b. $\cos^{-1}(1) =$ _____

c. $\tan^{-1}(1) =$ _____

d. $\sin^{-1}\left(\frac{\sqrt{2}}{2}\right) =$ _____

e. $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) =$ _____

f. $\tan^{-1}(0) =$ _____

g. $\tan^{-1}(-\sqrt{3}) =$ _____

h. $\cos^{-1}\left(\frac{1}{2}\right) =$ _____

i. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) =$ _____

45. $\lim_{x \rightarrow 2} (4x^2 - 3x + 2) =$

46. $\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x + 3} =$

47. $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x} =$

48. $\lim_{x \rightarrow \infty} \frac{2x - x^2}{6x^2 + 7} =$

49. $\lim_{x \rightarrow 0} \frac{\cot x}{\csc x} =$

50. $\lim_{x \rightarrow 2} \frac{5x|x-2|}{x-2} =$

51) $f(x) = \frac{\sin x}{e} + 3 \cos x$

$f'(x) =$ _____

$f''(x) =$ _____

52) $y = x^3 + x$ Find the equation of the tangent line at $(-1, -2)$.

53) $y = x^2 + 1$ find the average rate of change from $[-3, 2]$

54) $f(x) = \begin{cases} ax^3 & x \leq 2 \\ x^2 + b & x > 2 \end{cases}$ find a and b such that $f(x)$ is differentiable everywhere.

55) $g(t) = 2 + 3 \cos t$. Find the instantaneous rate of change at $t = \frac{-5\pi}{6}$.

56) Find the points where $y = x + \sin x$ has a horizontal tangent for $[0, 2\pi]$.

58) Find $\lim_{x \rightarrow \infty} x = \frac{-(x+h)^2 + 2(x+h) - (-x + 2x)}{h}$

59) Find the average rate of change for $[2, 8]$.

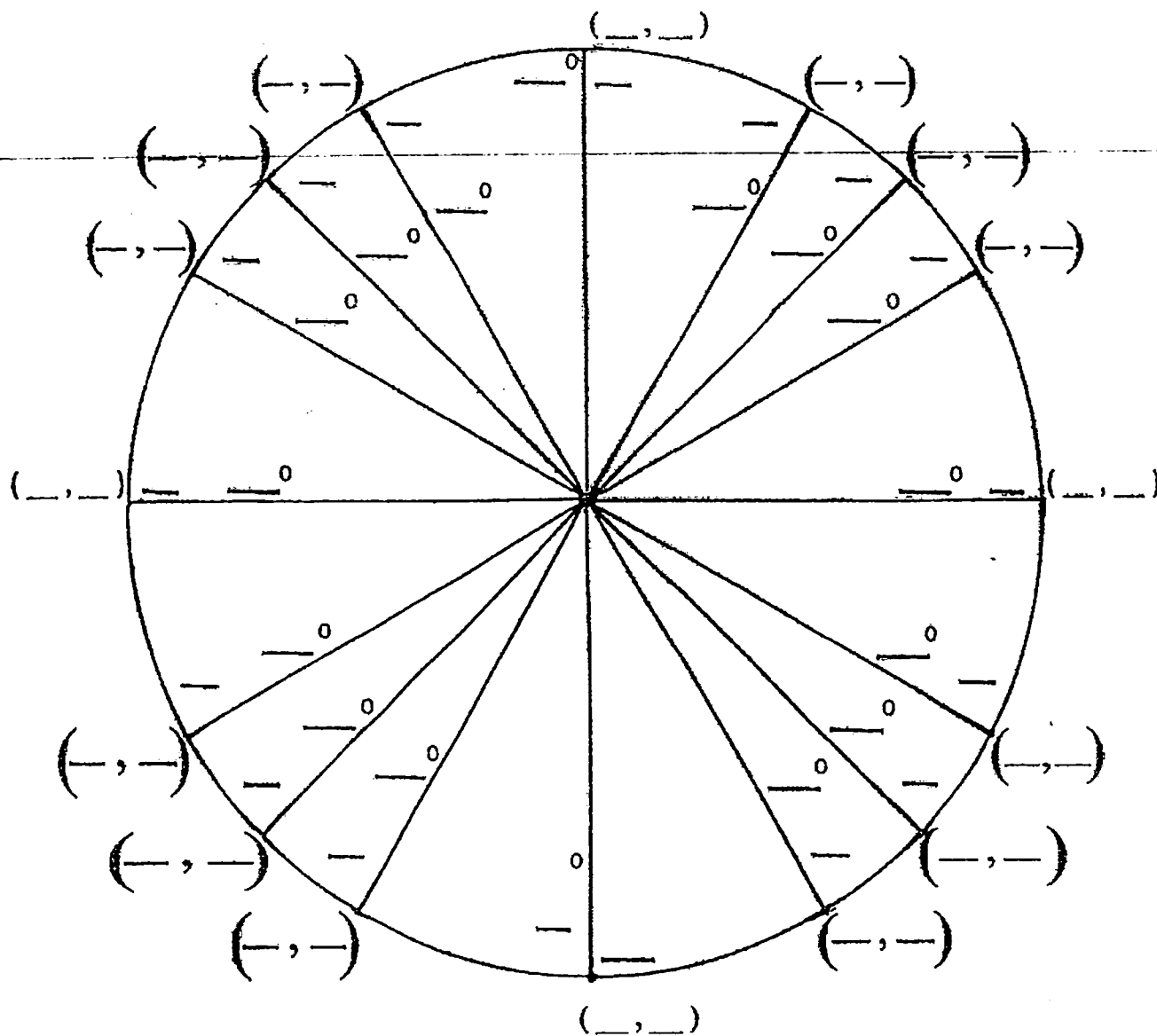
X	0	.2	.4	.6	.8	1
F(x)	3.7	3.5	3.5	3.9	4	3.9

60) Using the table, estimate $f'(.6)$

X	0	2	4	6	8	10	12
F(x)	10	18	24	21	20	18	15

1. Fill in the blanks on the unit circle. You should have degrees, radians, and coordinate points for every angle.

Unit Circle, Fill in the blank



you need to know

$\sin 30^\circ$
 $\sin 45^\circ$
 $\sin 60^\circ$

$\cos 30^\circ$
 $\cos 45^\circ$
 $\cos 60^\circ$

$\tan 30^\circ$
 $\tan 45^\circ$
 $\tan 60^\circ$