

Summer Problems

Prerequisite for Calculus

The following problems are for students to practice over the summer who are enrolled in AP Calculus for the 2023-2024 school year. Please bring them with you on the first day of classes.

Complete the following. Use directions given for each part. Do not use your graphing calculator. **Show all work** in the space provided. Write answers in most simplified form. Write answers in the indicated blank

- I. Find the x and y intercepts.

1.	$y = \frac{x^2 - 9}{2x}$	
		1. _____

- II. Determine which symmetry exists, y-axis, x-axis, and/or origin. Show all work.

2. $x^2 = y$	3. $y^2 = x^2 + 4$
	2. _____
	3. _____

- III. Find the equation of the line given the information. Leave answers in $Ax + By + C = 0$ form.

4. Containing points $(1, 3)$ and $(-1, 2)$	5. Parallel to the line $x - 2y = -5$ and contains the point $(2, 4)$
	4. _____
	5. _____

IV. Find the domain of the following functions. Write answers in interval notation.

6.	$f(x) = \frac{2x+1}{x^2 - 1}$	7.	$f(x) = x+1 $
	6._____		7._____
8.	$f(x) = \sqrt{4-x}$	9.	$f(x) = \log_2(2x+1)$
	8._____		9._____
10.	$f(x) = 3^{x+1} - 2$	11.	$f(x) = \sin\left(x + \frac{\pi}{6}\right)$
	10._____		11._____
12.	$f(x) = \tan x$		
	12._____		

V. Given $f(x) = 2x+3$ and $g(x) = 1-3x^2$. Find the following. Leave answers in most simplified form.

13.	$f(y-1)$	14.	$f(x) \bullet g(x)$
	13._____		14._____

Given $f(x) = 2x + 3$ and $g(x) = 1 - 3x^2$. Find the following. Leave answers in most simplified form.

15. $(g \circ f)(x)$	16. $f^{-1}(x)$
15. _____	16. _____
17. $\frac{g(x+h) - g(x)}{h}$	17. _____

VI. Determine if the function is odd, even, or neither. Show work!

18. $g(x) = -3x^2 - 5$	19. $f(x) = \frac{-x^3}{3x^2 - 9}$
18. _____	19. _____

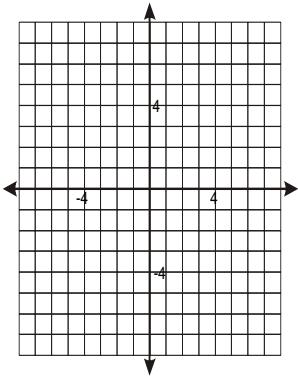
***On the next page, you will review graphing. Please make sure you review how to graph the six trig functions (sine, cosine, tangent, cosecant, secant and cotangent) as well. This should include when transformations are made -such as changing a, b, phase shift (h), vertical shift (k) and reflections.

VII. Graph the following using transformations. State the parent graph, name (h, k) , domain (interval notation), and complete the table.

<p>20. $f(x) = -2\sqrt{x+1} - 3$</p> <p>Parent _____</p> <p>(h,k) _____</p> <p>Domain _____</p> <table border="1"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td></td><td></td></tr> </tbody> </table>	x	y																									<p>21. $f(x) = \frac{2}{x-1} + 2$</p> <p>Parent _____</p> <p>(h,k) _____</p> <p>Domain _____</p> <table border="1"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td></td><td></td></tr> </tbody> </table>	x	y																						
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<p>22. $f(x) = \frac{1}{2}x^3 + 3$</p> <p>Parent _____</p> <p>(h,k) _____</p> <p>Domain _____</p> <table border="1"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td></td><td></td></tr> </tbody> </table>	x	y																																																	
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VIII. Graph the following piecewise functions. Evaluate each at the indicated values.

23. $f(x) = \begin{cases} 2x & x < 1 \\ 1-3x & x \geq 1 \end{cases}$



IX. Solve the following equations. Leave answers in exact value form.

24. $6x^2 - 7x - 3 = 0$

24. _____

25. $x^3 + 2x^2 - x - 2 = 0$

25. _____

26. $3^x = 5^{2x+1}$

26. _____

27. $\log_4(x+3) + \log_4(2-x) = 1$

27. _____

X. Solve the following inequalities. Write answers in interval form. (Hint: Use +/- charts for #28-29)

28. $x^2(x+3)(x-4) < 0$

28. _____

29. $\frac{-2(x+1)}{x-3} \leq 0$

29. _____

XI. Convert from logarithmic form to exponential form and vice versa.

30.	$1.2^3 = m$	31.	$\ln b = -3$
	30._____		31._____

XII. Find the exact values of the trigonometric functions.

32.	$\sin \frac{7\pi}{6}$	32._____	33.	$\cos \frac{11\pi}{6}$	33._____
34.	$\tan \pi$	34._____	35.	$\csc \frac{3\pi}{2}$	35._____
36.	$\cot \frac{2\pi}{3}$	36._____	37.	$\sec \frac{7\pi}{4}$	37._____

XIII. Evaluate the following inverse trigonometric functions for exact values (Radian form when appropriate).

38.	$\sin^{-1}(1)$	38._____
39.	$\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)$	39._____
40.	$\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right)$	40._____

XIV. Solve the following trigonometric equations for $[0, 2\pi)$.

41.	$2\sin\theta + \sqrt{3} = 0$	42.	$2\cos^2\theta + \cos\theta - 1 = 0$
	41._____		42._____
43.	$3\tan^2\theta + 1 = 2$	44.	$\cos^2\theta - \sin^2\theta + \sin\theta = 0$
	43._____		44._____

XV. Graph the following trigonometric functions. Name the amplitude, period, phase shift.

45.	$y - 1 = 2\sin 3\left(x - \frac{\pi}{3}\right)$	a=_____	46.	$y = 2\cos 2\left(x + \frac{4\pi}{3}\right)$	a=_____
		p=_____			p=_____
		PS_____			PS_____
47.	$y = -\tan\left(x - \frac{\pi}{4}\right)$	a=_____			
		p=_____			
		PS_____			

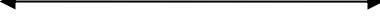
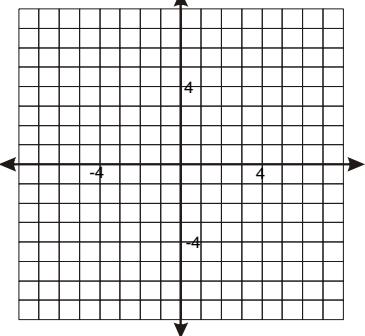
XVI. Use the Binomial Theorem or Pascal's Triangle to expand the following.

48.	$(2x - 3y)^3$	
	48._____	

XVII. Evaluate the following limits.

49.	$\lim_{x \rightarrow -3} \frac{x^2 + x - 6}{x^2 + 2x - 3}$	49._____
50.	$\lim_{x \rightarrow \infty} \frac{1 - 3x^2}{2x^2}$	50._____

XVIII. Graph and answer the following for the given rational function.

51.	$f(x) = \frac{x-2}{2x+3}$											
	Work	Answer										
Domain (Interval Notation)												
x-intercept												
y-intercepts												
Symmetries		y-axis origin none (circle one)										
Vertical Asymptote(s)												
Horizontal Asymptote												
Possible point of intersection of HA												
List zeros of numerator and denominator		Zeros of Numerator _____ Zeros of Denominator _____										
Complete +/- chant and list the intervals where the graph is above and below the x-axis		Above: _____ Below: _____										
Graph the rational function. List at least four additional points used.	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td><i>x</i></td><td><i>y</i></td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>	<i>x</i>	<i>y</i>									
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