Accelerated PreCalculus 2021-2022
Summer Assignments

Attached is a packet of problems that you need to solve and be prepared to discuss on the first day of school. This packet should be completed towards the end of summer break, but before the first day of school. You will be turn in the packet and your work during the first week of school. We realize that you may have some questions over some of these problems, and we encourage you to investigate on your own. If you still have questions after researching a problem for yourself, feel free to email us for further guidance. We will be checking school e-mail periodically during the summer. If we do not respond immediately, fear not, we will…eventually.

Your work and solutions can be done neatly on the packet or on separate paper. However, we should be able to follow your algebraic steps for each problem from beginning to end without having to hunt all over your paper. You may understand what your scribbles mean, but we need to see the proper mathematical steps from start to finish. When necessary, you may need to write an explanation of the thought process by which you found your answer.

We look forward to working with you next year!

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I. State the local maximum and minimum values (if they exist) and the intervals of increasing and decreasing for the following (3 decimal place accuracy and you may use Desmos.com)

1. $d(x) = -x^3 + x + 1$

        maximum_____   increasing_____

        minimum_____   decreasing_____

II. Determine whether the following function is even, odd, or neither. Show how you know.

2. $k(x) = \sqrt{x^2 - 4}$

III. Find the inverse of the following function, then find the domain and range of both

3. $f(x) = \dfrac{5}{x-2}$ $f^{-1}(x) =$

D: D:

R: R:

IV. Are the following functions one-to-one? How do you know?

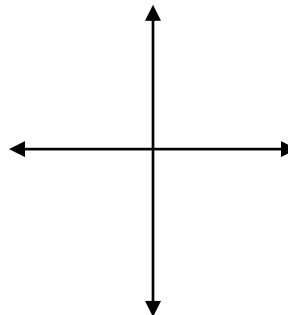4. $j(x) = -(x+2)^3 - 1$ 5. $h(x) = 2|x-1| + 2$

V. For each of the following, state the transformations, sketch the graph, and state the domain and range of the function. This should be done without a graphing utility of any kind.

6. $f(x) = 2(x-5)^3 - 1$

Transformations:
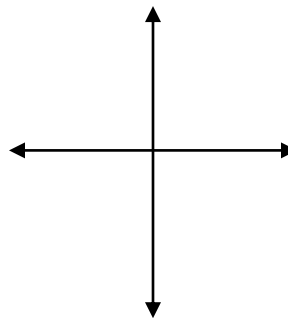
Domain:

Range:

7. $h(x) = -3(\sqrt{x+4})$
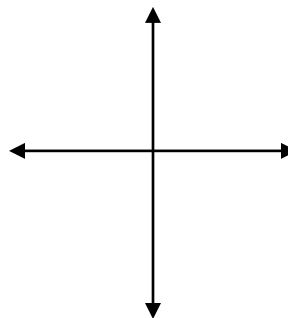
Transformations:

Domain:

Range:

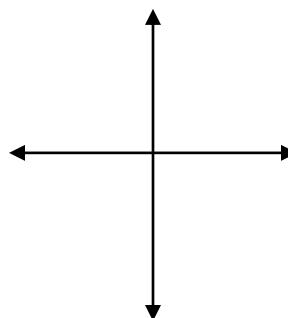8. $g(x) = 2 + |x+2|$

Transformations:

Domain:

Range:

9. $j(x) = -(x-2)^2 + 3$

Transformations:

Domain:

Range:

VI. Find the following and **state the domains**. Let $k(x) = \dfrac{1}{x+1}$, $h(x) = \sqrt{x+2}$, and n(x)= $-2x+3$.
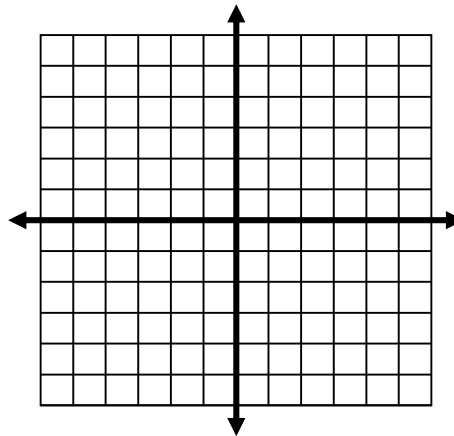
10. $k(n(x)) =$

11. $h + k =$

12. $\dfrac{h}{n} =$

13. Graph the following and state whether it is continuous.

$$m(x) = \begin{cases} 2x - 1, x < 2 \\ x^2 - 1, x \geq 2 \end{cases}$$

Domain:

Range:

Continuous?

Write an equation that satisfies each given condition:

14. The linear function with f(4) = -3 and f(6) = -7.

15. The quadratic function with vertex (8, -2) through the point (5, 10).

Solve the following using a power function:

16. Z varies directly as the square of y and inversely as x. If z = 2 when y = 6 and   x = 9, what is z when x = 3 and y = 4?

17. Fill in the correct data in the chart below.

Degree of f(x)	Sign of lead coeff.	$\lim\limits_{x\to\infty} f(x)$	$\lim\limits_{x\to-\infty} f(x)$	Max number of zeros	Max number of extrema
5	+				
		-∞			5
	−			9	
12			∞		

Determine if the binomial is factor of the polynomial.

18. (x + 5); $2x^2 + 15x + 25$

19. (x - 2); $3x^3 - 15x + 8$

Simplify the following complex numbers.

20. $(8 + 6i) - (-2 + 15i)$

21. $(5 - 8i)(4 - 6i)$

22. $\dfrac{-5+2i}{4-7i}$

VI. Find all EXACT roots of the following polynomials.

23. $f(x) = x^3 + 3x^2 - 8x + 140$

24. $g(x) = 2x^4 - 5x^3 + 9x^2 - 20x + 4$ if **2i** is a zero.

25. $f(x) = 6x^4 + 28x^3 - 28x^2 - 84x + 30$

VIII. Find the polynomial with the given roots.

26. -4 , (3 - i)

Solve each algebraically. Show ALL work.

27. $2x^3 - 8x > 0$

Solve the problem. You may use a calculator.

28. A farmer has 1200 feet of fencing and wants to fence off a **rectangular field** that borders a straight river. He needs no fencing along the river. What are the **dimensions** of the field that has the largest area?

29. A company needs you to design a box with no top from a **SQUARE** piece of cardboard. The company wants the height of the box to be 4 in, and the volume to be 324 in^3.

a.) Write a formula for the volume of the box (be sure to specify what x represents).

b.) Using your formula from part a.), what size piece of cardboard should you **start with** to meet the company's needs?

Compute the exact value (no decimals) of the function for the given x-value.

30. $f(x) = 3 \cdot 25^x$ for x = -2

Determine a formula for the exponential function.

31. The exponential function passes thru (0, 2) and (1, 4). What is the equation of the function?
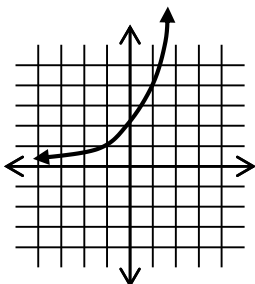
State whether the function is an exponential growth function or exponential decay function, and describe its end behavior using limits.

32. $f(x) = 0.2^x$

Write an exponential function that satisfies the given conditions. Use your equation to answer the question. Calculator allowed.

33. a) Initial Value = 35, increasing at a rate of 15% per year.

b) What will the amount be after 3.5 years?

Write a logistic function that satisfies the given conditions.

34. Initial value = 45, limit to growth = 180, passing thru (1, 72).

Solve the equation by changing it to exponential form.

35. $\log_4 x = -4$

36. $\ln x = 2$

Rewrite the expression as a sum, difference, or multiple of logarithms. Choose the best answer.

37. $\log_5 \left(\dfrac{16\sqrt{m}}{n} \right)$

Use the properties of logarithms to rewrite the expression as a single logarithm. Choose the best answer.

38. $4\log_m x - 7\log_m q^2$

Solve the equations algebraically. Leave answers in exact form.

39. $\log 9 = 2x$

40. $9 \ln (x - 3) = 27$

Solve the equations algebraically. Leave answers in exact form (no decimals).

41. $3^x = 18$

42. $5e^{6x+1} = 10$

43. $\log_4(x-8) + \log_4(x-8) = 1$

44. $\log_7(x+1) + \log_7 x = \log_7 2$

Use the given logistic equation to solve the problem.

45. Let $P(t) = \dfrac{500}{1 + 25e^{-.2t}}$ where P represents the number of students sick at SMHS with the flu at any time t in days. Determine when 50% of the students will have had the flu. (Calculator allowed)

Use the appropriate interest formula to find the amount that will be in an account, given the stated conditions. Calc allowed.

46. P = $200, t = 6, r = 19 % compounded continuously

47. P = $480, t = 8, r = 7 % compounded quarterly

Solve the problems. Calc allowed.

48. A cake is removed from an oven at 325 °F and cools to 150 °F after 25 minutes in a room with a temperature of 68 °F. What is the **total time** it takes the cake to cool to 115 °F? (use Newton's Law of Cooling)

Solve the system of equations.

49.
$$7x + 5y = 10$$
$$-2x + 2y = 4$$

50.
$$x^2 + y^2 = 25$$
$$y^2 - x = 5$$

51.
$$\frac{x^2}{3} + \frac{(y-2)^2}{9} = 1$$
$$x + y = 1$$

Give the name of each conic. Transform the equation in order to find important characteristics. List the center, foci, vertices, asymptotes, **etc. when applicable**. Then, sketch your conic section.
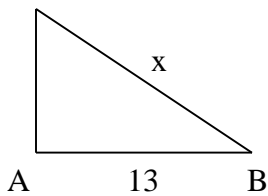
52. $x^2 + 16 + y^2 - 12y - 8x + 20 = 0$

53. $3x^2 + 2y^2 + 24x - 12y + 18 = 0$
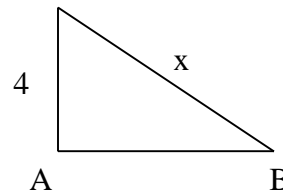
54. $-x^2 + 9y^2 + 2x + 54y + 44 = 0$

Calculator allowed for these trig problems.

55. Solve for x.   56. Solve for x.

A=90°
B=34°

A=90°
B=43°

57. From a distance of 155 feet from the base of a building, the angle of elevation to the top of the building is $61°$. Find the height of the building.

58. A police helicopter is monitoring the speed of two oncoming cars on a straight road. The helicopter is at an altitude of 2600 feet directly above the road. At one instant, the angle of elevation from the first car to the helicopter is $22°$, and the angle of elevation from the second car to the helicopter is $15°$. How far apart are the two cars?