**Advanced Pre-Calculus Summer Work**

***All work and answers should be on a separate sheet of paper. All work must be shown in order to receive full credit.***
***If you worked with someone on these problems (friend, parent, sibling, tutor, etc), please indicate so on the top of your paper.***

*Factor completely and simplify.*

1. $\frac{1}{4}x^2 - x - 48$

2. $8x^2 + 12x^5$

3. $4x^2 + 28x + 49$

4. $8x^3 - 1$

5. $x^3 + 3x^2 - 9x - 27$

6. $4(a-1)^2 - 2(a-1)$

7. Expand the expression completely: $\log_3 \frac{\sqrt[3]{x^2y}}{27}$

8. Solve each system of equation.

$3x + 8y = 7$
$2y = 6x - 32$

$x^2 - y^2 = 4$
$y = 2x + 4$

$x + 2y - z = -3$
$4x - 2y + z = 18$
$4x + 5y + z = 4$

9. Given $f(x) = x^2 + 2x - 5$, find $f(x + h)$.

10. Condense to a single expression: $\ln(x-1)+\ln(x^2)-\ln(x^2+x)$

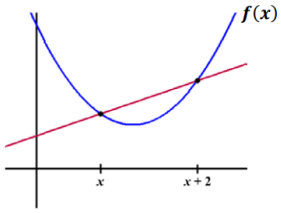
11. Use the graph to determine which expression represents the slope of the secant line. Choose one answer.

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

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

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

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



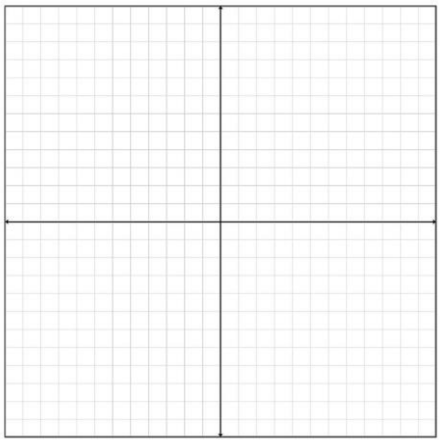

12. Given the function $f(x)=x^4-13x^2+36$, answer the following questions.

a) Write the domain and range in interval notation.

b) Describe the end behavior in proper notation.

c) Find the y-intercept.

d) Find the x-intercept(s).



e) Sketch the graph.

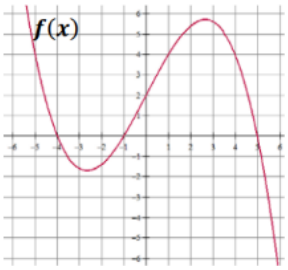
13. Use the graph of $f(x)$ to select any true statements from the list below. Choose all that apply.

a) $f(2)=4$

b) $f(0)=1$

c) $(x-5)$ is a factor of $f(x)$

d) $f(1)=f(4)$




*Find all the zeros (real and imaginary) of each function.*

14. $f(x)=x^3+x^2-4x-4$

15. $f(x)=x^4+2x^3+3x^2-2x-4$

16. $f(x) = 20x^3 - 500x$

17. $f(x) = x^3 + 8$

18. Given the volume of a cylinder: $V = \pi r^2 h$.

a) Write the formula for height in terms of volume if the radius of the cylinder is four times the height of the cylinder. You do NOT have to rationalize the denominator!

b) Find the height of the cylinder if the volume is $64\pi$ cubic centimeters.

*Find the inverse of the function and write as a function of x.*

19. $y = x^2 + 2x + 1$

20. $y = \frac{x+5}{2x}$

21. $y = 4^x$

*Give the domain and range of each function in interval notation.*

22. $f(x) = x^2 + 8x + 16$

23. $g(x) = \sqrt{x-2} + 1$

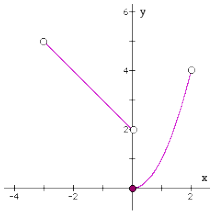
24. $h(x) = 2(x-3)^3 + 7$

25. Explain what an asymptote is and identify the asymptotes in the equation $y = \frac{2}{x+8} + 4$

26. Answer the questions about the graph of the function f(x) to the right.

a) Write the domain and range in interval notation.

b) Evaluate f(0) and f(-1).



*Simplify each expression without a calculator. Make sure to rationalize any denominators.*

27. $5i^{12}$

28. $\frac{12}{\sqrt{2}}$

29. $\log 10$

30. $\frac{12x^4y^{-2}z^3}{6x^6y^{-5}z}$

31. $\sqrt[3]{216}^{-2}$

32. $\left(9a^{\frac{5}{3}}\right)^{\frac{3}{2}}$

44. $\frac{2n^2-5n-12}{n^2-10n+24} \div \frac{4n^2-9}{n^2-9n+18}$

45. $\frac{x^2+8x-20}{x^3-4x}$

46. $\frac{1}{b^2-5b+6} + \frac{1}{b^2-4}$

47. $\ln \sqrt[5]{e}$

*Solve each equation without a calculator. Check for extraneous solutions!*

48. $2x^2 + x - 5 = 0$

49. $\log_4 x^3 = 6$

50. $x + 2 = \sqrt{2x + 7}$

51. $8^{2x+5} = \left(\frac{1}{16}\right)^{x+2}$

52. $\frac{1}{x-2} + \frac{3}{x+3} = \frac{4}{x^2+x-6}$

53. $\ln x = 0$