Welcome to Applied Calculus!!!!

This summer packet is for all students enrolled in Applied Calculus at Herndon High School for Fall 2023.

The exercises will give you the opportunity to self-assess how prepared you are for Applied Calculus this year. Success in the school year will depend how well you understand the topics included, so put your best effort into it! Feel free to use old notes and online resources as needed to ensure that you understand the content.

Please complete the work for this packet on a separate piece of paper. Do as many of the problems as you can WITHOUT a calculator. It is important to spend time keeping these skills and concepts fresh in your mind – especially your mental math! We will provide you with a key at the start of next year for you to check your work. Be sure to keep track of sticky spots and ask questions when we return. You are also welcome to reach out to us over the summer; our contact information is below.

This summer assignment is not *required*, but it is *strongly recommended.*

Have a great summer – we are looking forward to meeting you in August!

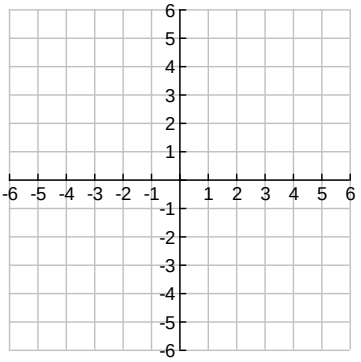
Mrs. Glazier
tjglazier@fcps.edu

As you work through the packet, keep track of the following:

Concepts I remember how to do	**Concepts I learned, but forget how to do**	**Concepts I never learned**

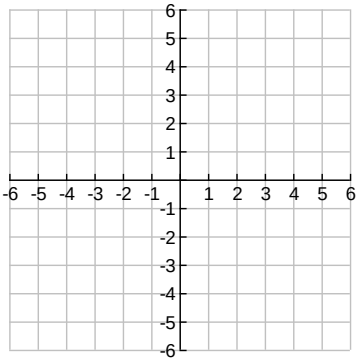
Part 1: Graphing: Sketch the parent functions and state the domain and range in interval notation.

1) $f(x) = x$



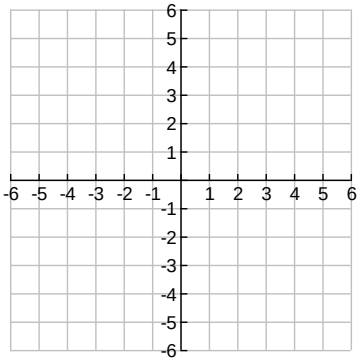
Domain: Range:

2) $f(x) = x^2$



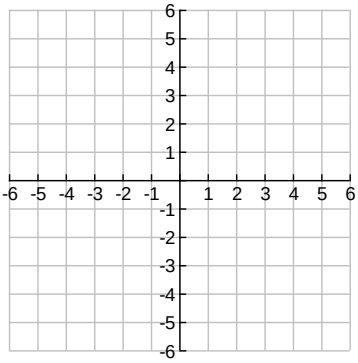
Domain: Range:

3) $f(x) = x^3$

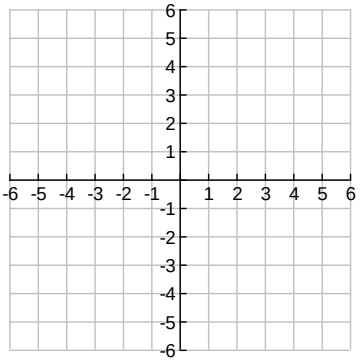


Domain: Range:

4) $f(x) = |x|$

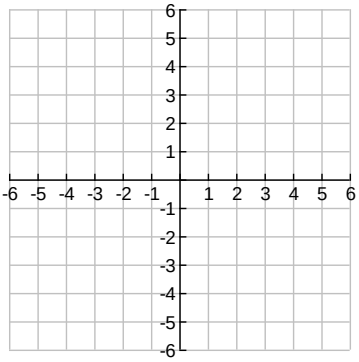


5) $f(x) = \sqrt{x}$



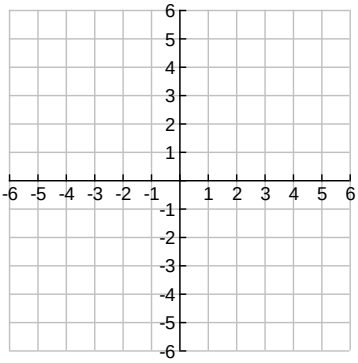
Domain: Range:

6) $f(x) = \sqrt[3]{x}$



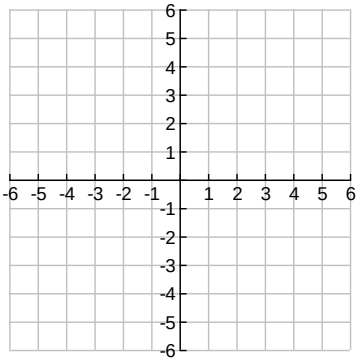
Domain: Range:

7) $f(x) = e^x$



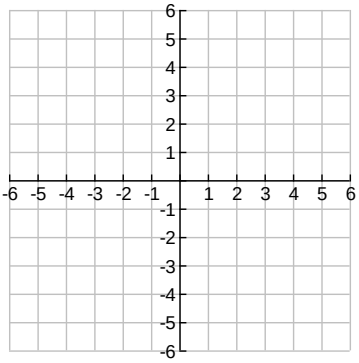
Domain: Range:

8) $f(x) = \ln x$



Domain: Range:

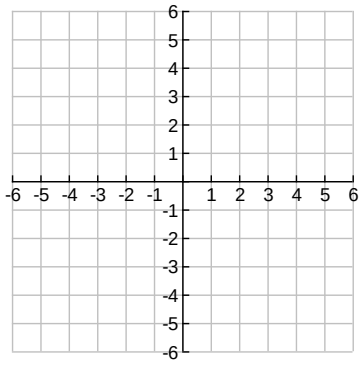
9) $f(x) = \dfrac{1}{x}$



Domain: Range:

Sketch the graph and complete the following:

10) $g(x) = -|x-2|+1$



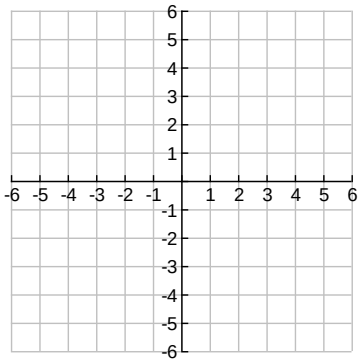
Domain: _____

Range: _____

End Behavior as $x \to -\infty$, $x \to \infty$

Transformations:

11) $h(x) = (x+3)^2 - 1$



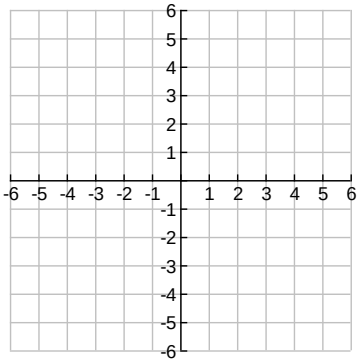
Domain: _____

Range: _____

End Behavior as $x \to -\infty$, $x \to \infty$

Transformations:

12) $j(x) = \sqrt{5x-10}$



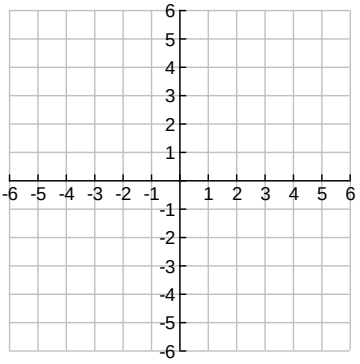
Domain: _____

Range: _____

End Behavior as $x \to -\infty$, $x \to \infty$

Transformations:

13) $k(x) = -\sqrt[3]{x} - 2$



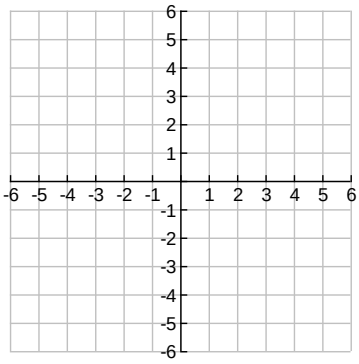
Domain: _____

Range: _____

End Behavior as $x \to -\infty$, $x \to \infty$

Transformations:

14) $m(x)=\frac{2}{3}x+1$



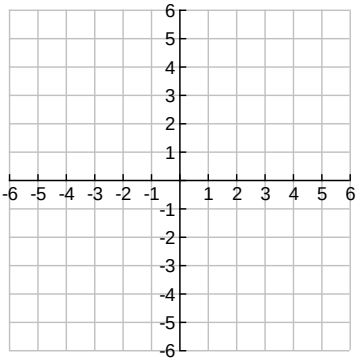
Domain: _____

Range: _____

End Behavior as $x\to-\infty$, $x\to\infty$

Transformations:

15) $n(x)=2+(x-1)^3$



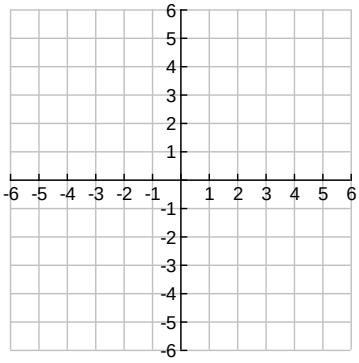
Domain: _____

Range: _____

End Behavior as $x\to-\infty$, $x\to\infty$

Transformations:

16) $p(x)=-\log_3(x-2)$



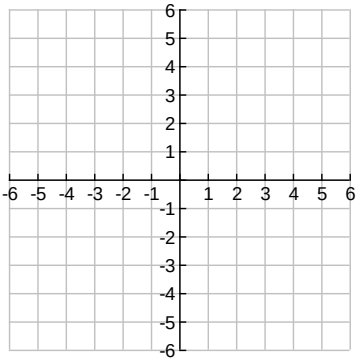
Domain: _____

Range: _____

End Behavior as $x\to-\infty$, $x\to\infty$

Transformations:

17) $q(x)=2^{x+3}-1$



Domain: _____

Range: _____

End Behavior as $x\to-\infty$, $x\to\infty$

Transformations:

Part 2: Algebra Review

Factor completely.

18) $x^3 - 3x^2 + 5x - 15$

19) $2x^2 + 22x - 24$

20) $x^2 + 49$

21) $x^3 + 125$

22) $x^2 - 2x + 1$

23) $3x^3 - 24$

24) $3x^2 + 11x + 6$

25) $x^2 - 100$

26) $4x^3 - 4x^2 - 9x + 9$

27) $x^4 + 6x^2 + 8$

28) Evaluate when k = -4, m = -3 and r = 5

a. $2k^2 - r^2$

b. $-5(3r - 2m)$

c. $\dfrac{4k^2 + r}{m - 6}$

29) Solve for all solutions:

a. $(x-5)^2 = 9$

b. $3x^3 - 6x^2 - 45x = 0$

30) Simplify with all positive exponents. Assume all variables are non-zero real numbers.

a) $\dfrac{(2y)^5\, y^2}{y^{-8} y^3}$

b) $\dfrac{(2x)^{-4}(x^{-1})^{-3}}{3(x^{-5})^{-2}}$

c) $\left[\dfrac{x^{-3/4} \cdot y^{1/4}}{x \cdot x^{-5/4}}\right]^{-1}$

Simplify:

31) $\frac{x^2-7x+10}{x^2-1} \times \frac{x+1}{x-5}$

32) $\frac{x^4+2x^2-3x^2}{x^2-6x+5} \div \frac{x^3-9x}{x^2+x-30}$

33) $\frac{2}{x-1} - \frac{1}{1-x}$

34) $\frac{x^2+7x+12}{x^2-16}$

35) $\frac{6}{x^2-9} + \frac{1}{2x-6}$

36) $\frac{\frac{1}{x+3}+\frac{1}{x}}{x}$

37) Given points S (- 3, 4) and T (6, - 7) Find the following:

a. the midpoint of $\overline{ST}$

b. distance between points S and T

c. the slope of $\overline{ST}$

d. the equation of the line that contains $\overline{ST}$

38) Given the line $3x - 5y = 7$, find the **point-slope form** of the equation of a line through (3, 1) that is

a. parallel to the given line

b. perpendicular to the given line

39) Given $f(x) = 5 - 3x^2$, find $f(-1)$

40) Given $f(x) = 2x + 5$, find:

a. $f(x+3)$ b. $f(f(x))$ c. $f(x+1) - f(x)$

41) Let $f(x) = x^2 + 3x - 2$, $g(x) = 4x - 3$, $h(x) = \ln x$, $w(x) = \sqrt{x-4}$

a. $f(g(x)) =$ b. $h(g(f((1)))) =$ c. $f(a+h) =$

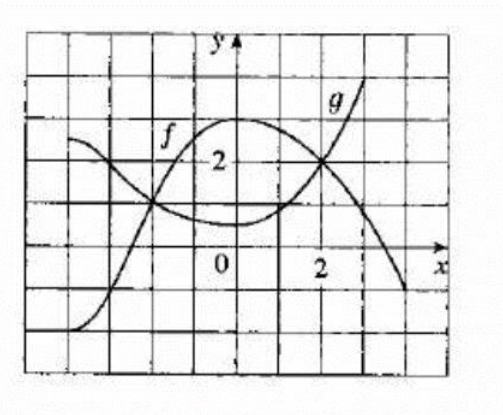
42) The graphs of ***f*** and ***g*** are given.

a. Find values of $f(-4) =$ and $g(3) =$

b. For what value of x is $f(x) = g(x)$?

c. Estimate the solution for equation $f(x) = -1$

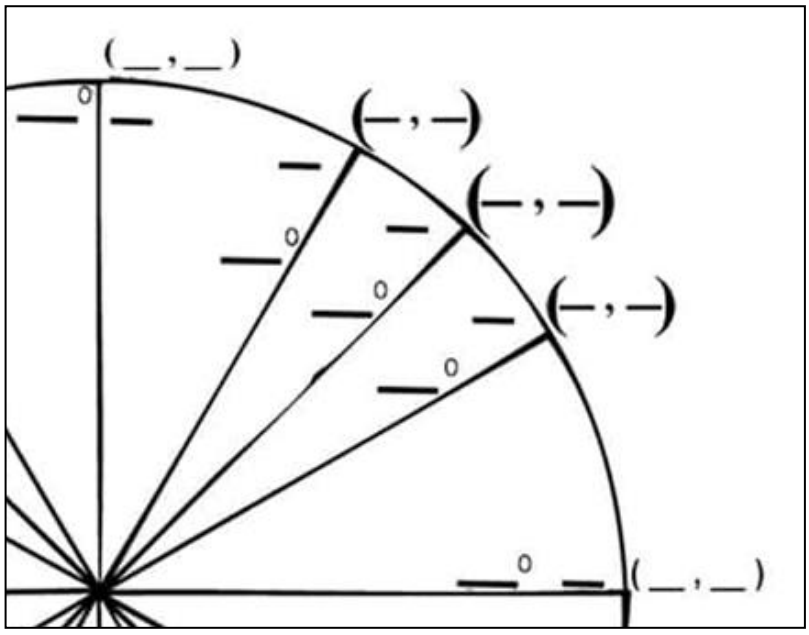
d. On what interval is f(x) decreasing?



Part 3: Trigonometry Review

Quadrant 1 of the Unit Circle:

43) Fill in the blanks for the:
   a. (x, y) coordinate values
   b. degree values
   c. radian values.



Find the exact value.

44) $\cos\frac{5\pi}{3}$

45) $\sin\frac{11\pi}{6}$

46) $\cot\frac{5\pi}{6}$

47) $\cot\frac{3\pi}{2}$

48) $\tan\frac{3\pi}{4}$

49) $\sec\frac{4\pi}{3}$

50) $\csc\frac{2\pi}{3}$

51) $\sec 5\pi$

52) $\sin\frac{7\pi}{4}$

53) $\cos\frac{17\pi}{6}$

54) $\arccos 1$

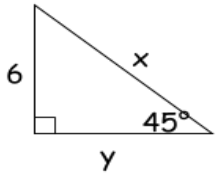
55) $\arctan 1$

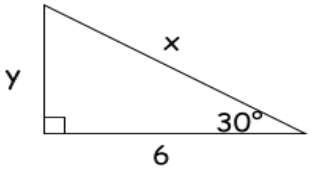
Solve the following trigonometric equations in the given interval.

56) $2\cos\theta+1=0$ *for all values.*

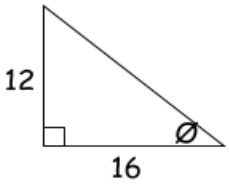
57) $2\sin^2\theta-3\sin\theta+1=0$ *for* $-2\pi\le\theta\le2\pi.$

58) Find the missing sides in each:





59) For the triangle, find the indicated:



$\sin\theta=$ $\cos\theta=$ $\tan\theta=$