Dear Student,

Welcome to Honors PreCalculus! The honors precalculus course gives mathematics students the unique opportunity to explore fundamental concepts and ideas at a greater depth, thus strengthening general mathematical appreciation and maturity. Together, we shall aim to strengthen general problem-solving skills and achieve comfort with careful mathematical thought, while laying down the foundation for more advanced math courses, such as single and multivariate calculus, linear algebra, and discrete mathematics.

Topics in this course include a brief review of linear; quadratic; polynomial; rational; and root functions, an analysis of the major transcendental functions, such as exponential, logarithmic, and trigonometric functions; equations; inequalities; and applications. Further topics include conic sections and analytic geometry; sequences and series with their application to calculus and probability; systems of linear and non-linear equations, and matrices; the Binomial Theorem;, partial fraction decompositions; and (time permitting) elementary operations on two dimensional vectors and their geometric representation; polar coordinates and graphs; and an introduction to limits.

The aim of this assignment is to provide students the opportunity to re-freshen their math skills so that the start of this course begins smoothly. Having a sound foundation of the material in this packet will allow us to transition to the new material quicker, allowing more time for discussion of different topics. This packet was made to be thought provoking and there will be problems that may just take time to wrap your head around, so spending a longer amount of time on a single problem may happen. While it may be frustrating, figuring out a difficult problem on your own makes the experience much more rewarding.

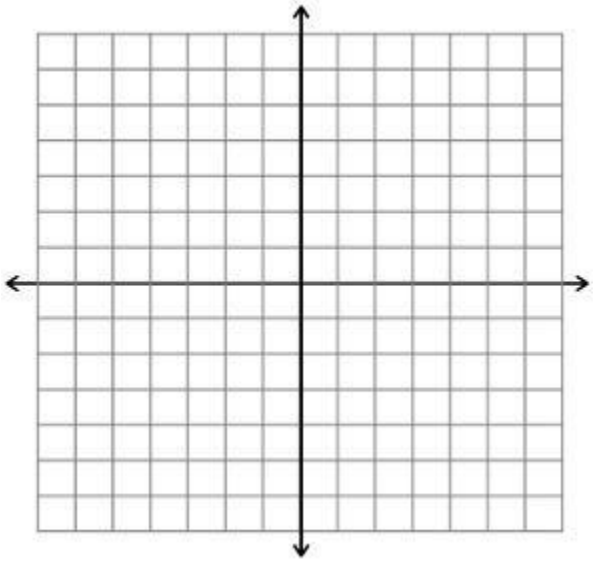
This packet is required. You can print it out or do work on your own paper. Please show all work associated with each problem - it is good practice for what you will be asked to do this coming school year. If you have any specific questions about this assignment please reach out to your teacher, Mrs. Clements at clements@swampscott.k12.ma.us

Have a great summer!

Name:_____ Score:_____

A.

$$f(x)=4(2)^{x-1}-8$$



Equation of Asymptote:

x – Intercept:

y – Intercept:

Domain:

Range:

Interval Increasing:

Interval Decreasing:

Where is $f(x)\geq 0$?

Where is $f(x)<0$?

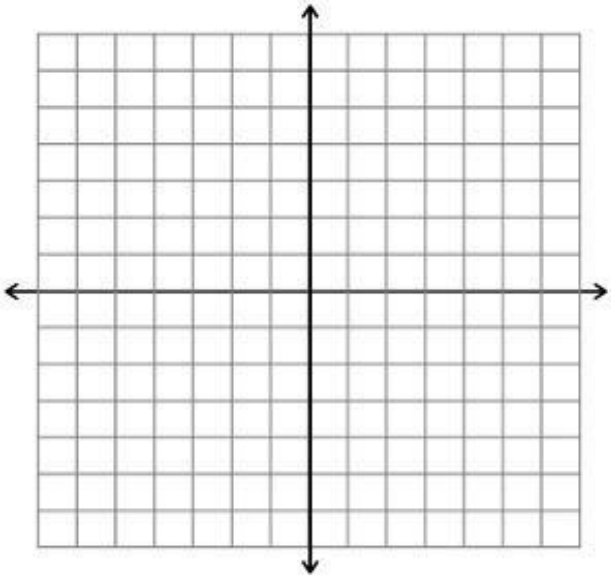
Evaluate $f(-4)$

Solve for $f(x)=-3$

As $x\to -\infty, f(x)\to$_____

B.

$$f(x)=-2|x+3|+6$$



Name of Function:

Domain:

Range:

Interval Increasing:

Interval Decreasing:

Where is $f(x)\geq 0$?

Where is $f(x)<0$?

x-Intercept(s):

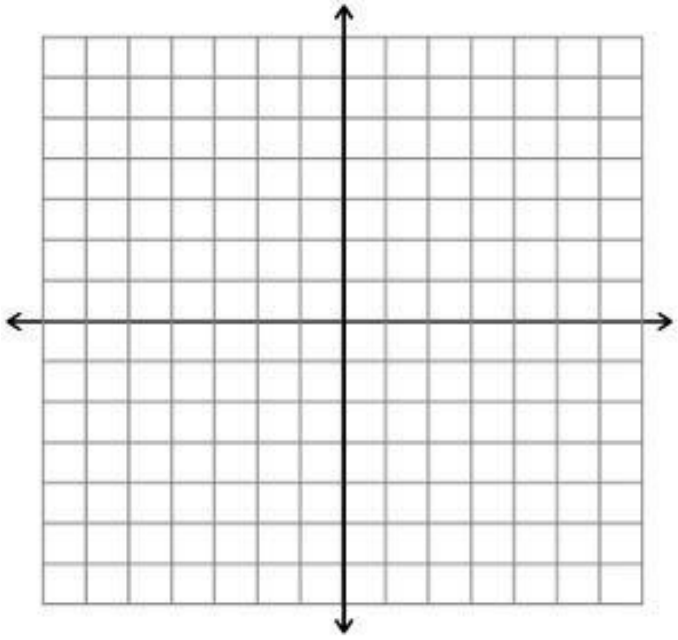
y-Intercept:

Evaluate $f(-1)$

x, where $f(x)=4$

As $x\to\infty, f(x)\to$_____

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



C. Technical Name of Polynomial (think highest degree and number of terms):

Domain:

x – Intercept(s) with Multiplicity:

y – Intercept:

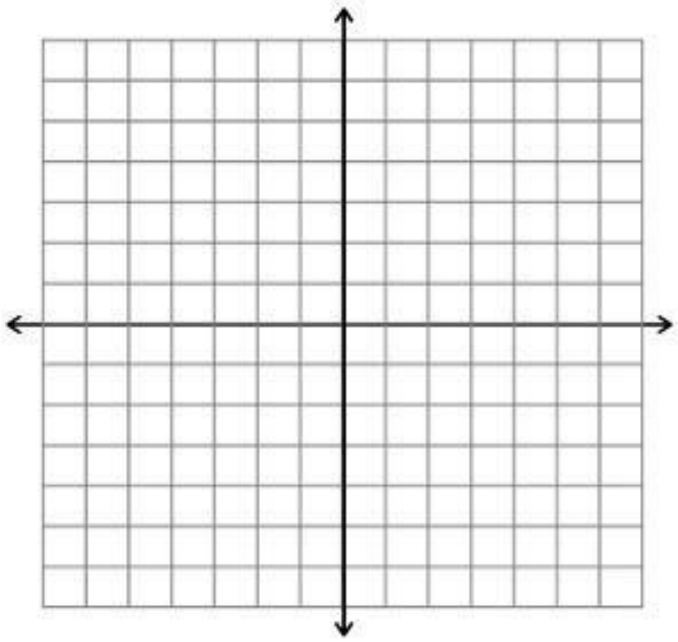
Where is $f(x)>0$?

Where $f(x)\le 0$?

As $x\to -\infty, f(x)\to$

As $x\to\infty, f(x)\to$

D. $f(x) = x^4 - 5x^2 + 4$



D. Degree:

Domain:

x – Intercept(s) with Multiplicity:

y – Intercept:

Where is
$f(x) > 0$??

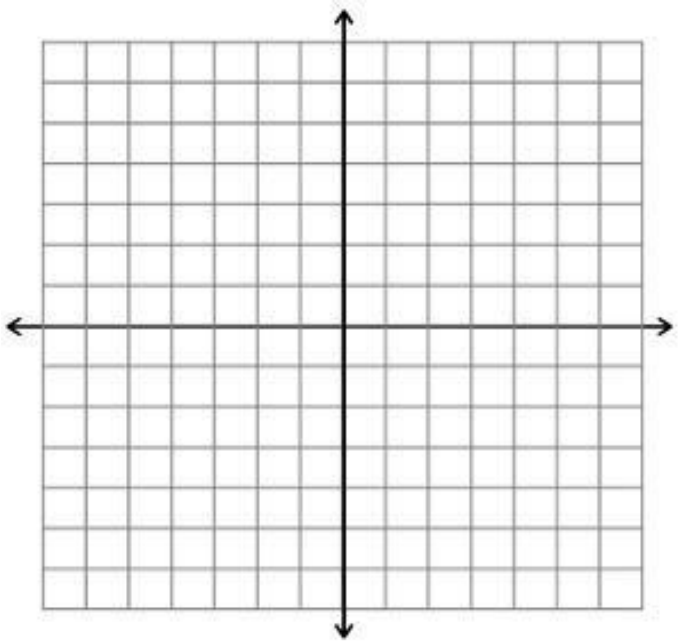
Where $f(x)\le 0$?

As $x\to -\infty, f(x)\to$

As $x\to\infty, f(x)\to$

E.

$$f(x)=\begin{cases}(x+4)^2-2 & -6\le x\le -2\\ 2|x|-2 & -2<x\le 1\\ -2x+4 & 1<x\le 4\end{cases}$$



E. Is this function continuous or discontinuous on its domain? If the function is discontinuous, give the domain values where the discontinuities occur.

Domain:

Range:

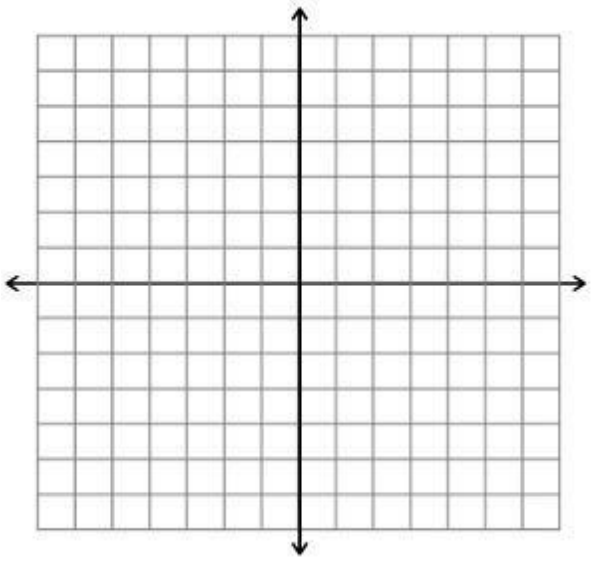
Interval Increasing:

Interval Decreasing:

Evaluate $f(-1)$:

Evaluate $f(2)$:

F. $f(x)=\dfrac{-4}{(x+2)^2}+1$



F. Vertical Asymptote:

Horizontal Asymptote:

x – Intercept(s):

y – Intercept:

Interval Increasing:

Interval Decreasing:

Where is $f(x) > 0$?

Where is $f(x)\le 0$?

2. Factor each polynomial expression completely.

$8x^4+22x^2-21$	$y^5 + 3y^3 + 4y^2 + 12$
$8x^4 - 4x^3 + 12x^2$	$9x^2(x + 1) + 5x(x + 1) - 4(x + 1)$

3. Solve the following inequalities. Your answer should be in interval notation.

$4x^2-x-5\geq 0$	$4x^3-8x^2-9x+18<0$

4. Rewrite the quadratic equation in vertex form by completing the square. Is the vertex a maximum or minimum? What is that extreme value?

$$f(x) = 3x^2 + 9x - 4$$

5. A parabola has vertex (2,1) and a vertical axis of symmetry. The parabola passes through the points (3,3) and (5, *p*). What is the value of *p?*

6. Determine a fourth degree polynomial function, $P(x)$, in <u>standard form</u> given the following information:

$P(3i) = 0$ $P(-\sqrt{5}) = 0$ $P(2) = 26$

7. Simplify the expression completely.

$$\left(\frac{\left(3x^{-5}y^{3}\right)^{-2}\left(y^{-5}z^{2}\right)^{-3}}{\left(3xy^{2}\right)^{-4}\left(x^{2}y^{-3}z^{4}\right)^{-2}}\right)^{2}$$

8. Solve each equation or inequality.

$\sqrt{3x-5}=2-\sqrt{x-1}$	$3(x+1)^{\frac{4}{3}}-2=46$

9. Use properties of logarithms to simplify each expression.

$\log_7 7^{\log_7 49}$	$\log_4 12-\log_4 36+\log_4 192$
$3\log_{\frac{4}{9}}\sqrt[4]{\frac{27}{8}}$	

10. Solve each equation or inequality completely.

$\log_6(x+2)-\log_6(4x+3)=\log_6\left(\frac{1}{x}\right)$	$\sqrt{\frac{9^{x+3}}{27^x}}=81$
$\ln(x-1)+\ln(x+2)=1$	$6^{2-x}=2^{3x+1}$ (write your answer as a single logarithm)

11. Simplify the following expressions completely.

$\frac{6x^2+17x-40}{x^2+x-20}+\frac{3}{x-4}-\frac{5x}{x+5}$	$\frac{\frac{3}{x-2}-\frac{4}{x+2}}{\frac{7}{x^2-4}}$

12. Solve each equation. Do NOT use a calculator.

$\frac{a+x}{a}-\frac{2x}{a+x}+\frac{x^2(x-a)}{a(a^2-x^2)}=\frac{1}{3}$	$4x^{-4}-5x^{-2}+1=0$

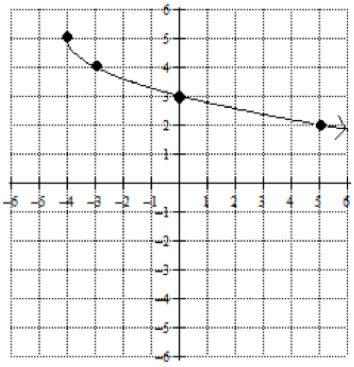
13. Perform the indicated operations over the given functions and state the domain for each part.

$$f(x)=\frac{x}{1-x}, \qquad g(x)=\sqrt{2x+3}$$

$(f+g)(x)$	$(f-g)(x)$	$(f\cdot g)(x)$
$(f\circ g)(x)$	$(g\circ f)(x)$	$\left(\frac{f}{g}\right)(x)$

14. Find $(f\circ g\circ h)(x)$ **if** $f(x)=\sqrt{x-3}$ $g(x)=x^2$**, and** $h(x)=x^3+2$**.**

15. A function is graphed below. Graph the inverse of f(x), that is, $f^{-1}(x)$. Then, write the equation of f(x), and state the domain and range of f(x) and $f^{-1}(x)$.



16. Determine the inverse of each function and state the domains of $f^{-1}(x)$.

$f(x)=\frac{2x-1}{3x+4}$	$f(x)=4^{x+3}+2$