SUMMER MATH ASSIGNMENT
CALCULUS (5520)

You are taking **Calculus** in the fall. A mastery of and proficiency performing the following Algebra and Pre-Calculus skills will be necessary for success in the Introduction to Calculus course. Work on each problem in order. Copy the problem onto loose-leaf paper; show all work in a neat and organized manner. Box in your final answer. Complete this entire assignment and bring to class on the first day.

This assignment is MANDATORY and the math department strongly encourages you do this assignment on your own and to the best of your ability. Since the material contained in the summer math packet is *prerequisite material* you are responsible for having learned and retained. If you have forgotten any of these important mathematical concepts, you will find at the end of this assignment, several links to websites that you might find helpful should you have any problems or need some additional support on this assignment

At the end of this assignment are several links to websites that you might find helpful should you have any problems with your assignments.

Calculus (5520) Mandatory Summer Assignment

I. Factor each expression completely.

1. $x^2+3x-10$
2. x^2+5x+6
3. $x^2+8x+15$
4. x^2+4x+4
5. $2x^2-22x+48$
6. $x^2-15x+50$
7. $x^2-9x+20$
8. $2x^2+11x-21$
9. $18x^2-3x-1$
10. $3x^2-4x-15$
11. $9x^2+24x+16$
12. $6x^2+7x-3$
13. x^2-y^2
14. x^4-y^4
15. x^2-25
16. $2x^2-32$
17. x^3-1
18. x^3+64
19. x^3-y^3
20. $8x^3-27$
21. $16x^3-128$
22. x^3-9x
23. $18x^3-34x^2+16x$
24. x^4-x^2

II. Simplify each expression:

1. $\dfrac{\dfrac{x^2+2x+1}{x+1}}{3}$
2. $\dfrac{\dfrac{5x^2-20}{2x+2}}{\dfrac{10x-20}{4x}}$
3. $\dfrac{\dfrac{2y}{y^2-4}}{\dfrac{3}{y^2-4y+4}}$
4. $\dfrac{\dfrac{x^2+7x}{3x}}{\dfrac{49-x^2}{3x-21}}$
5. $\dfrac{x}{x-2}-\dfrac{1}{x+2}$
6. $\dfrac{3}{x-2}-\dfrac{2}{x-3}$

III. Write in exponential form:

1. $\sqrt{x}$ **4.** $x\sqrt{x}$ **7.** $\sqrt{x}\sqrt[3]{x}$

2. $\sqrt[3]{y}$ **5.** $\sqrt[3]{a^5b^7}$ **8.** $x^2\sqrt[3]{x}$

3. $\sqrt[4]{z^3}$ **6.** $\sqrt{a^3b^4}$ **9.** $\sqrt[3]{\sqrt{xy^3z}}$

IV. Write in simplest radical form: (if completely simplified state that)

1. $x^{\frac{1}{2}}$ **4.** $x^{\frac{3}{2}}y^{\frac{5}{4}}$ **7.** $x^{\frac{1}{4}}\sqrt{x}$

2. $x^{\frac{3}{4}}$ **5.** $x\sqrt{x}$ **8.** $x^2\sqrt[3]{x}$

3. $x^{\frac{3}{2}}y^{\frac{5}{2}}$ **6.** $\sqrt{x}\sqrt[3]{x}$ **9.** $\sqrt{8x^3y^5z^7}$

V. Simplify:

1. $\dfrac{2x^{-2}y^2z}{6x^{-3}y^{-2}z}$ **2.** $2x^{-3}y^{-1}$ **3.** $\dfrac{3(2x)^3y^{-2}\sqrt{y}}{6xyz^{-3}}$

4. $3\sqrt{18}-2\sqrt{50}$ **5.** $\dfrac{2xy^{-1}}{z}\left(\dfrac{3x^{-2}}{yz}\right)^3$ **6.** $\dfrac{(2x-6)}{4x+2}\bullet\dfrac{16x-4}{(x-3)}$

VI. Simplify the following expressions: (No Calculator)

1. $\ln e$ **4.** $\ln\sqrt{e}$ **7.** $e^{3\ln x}$

2. $\ln e^x$ **5.** $e^{\ln 7}$ **8.** $\log_{\frac{1}{2}}16$

3. $\ln\dfrac{1}{e}$ **6.** $\ln\sqrt[4]{e}$ **9.** $e^{\ln(2x)}$

VII. Solve the following equations: Show all work

1. $2^x = 32$ **4.** $25^x = 125$ **7.** $17.428^x = 1$

2. $\mathbf{27^x = 9}$ **5.** $8^x = 4$ **8.** $\mathbf{\ln(x+3) = 2}$

3. $\mathbf{4^x = \frac{1}{16}}$ **6.** $8^x = 16$ **9.** $2e^x - 1 = 17$

10. $18x^3 - 34x^2 + 16x = 0$ 11. $x^2 + 3x = 7$

VIII. Functions and their graphs:

1. Define a function: Begin your sentence with: A function is…
2. What are the 4 ways in which a function can be represented?
3. What is the inverse of a function?
4. What is a composite function?
5. Explain what $f(5)$ is asking for?
6. There are <u>two</u> important properties of functions and their inverses what are they?
7. Given the function $f(x) = x^2 - 2x$ find $f(-4)$ _____

8. Write the domain of the function $f(x) = \sqrt{3x+4}$ **(use interval notation).**

9. Write the domain and range of the function $f(x) = 3x^3 - 4x^2 + 2x - 7$ **(use interval notation).**

10. Write the domain of the function $f(x) = \frac{1}{x-4}$

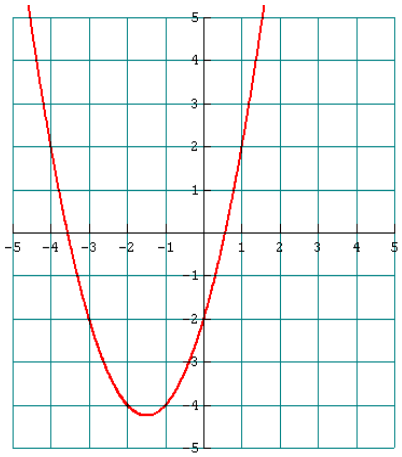
11. The table below shows the amount spent on student scholarships (in millions of dollars) by The College of New Jersey in recent years. **Is the relation a function? Justify your answer.**

Yes or No (<u>circle one</u>). **<u>Explain</u>** using the definition of a function

Year	Scholarships
1998	27.5
1999	28.7
2000	31.1
2001	34.3
2002	34.3
2003	36.8
2004	40.1

<u>Use the 3 functions</u> represented <u>below to answer questions 12 &13</u>.

$g(x)$ (graph)



$f(x) = 2x - 4$

x	$h(x)$
-3	0
0	-1
3	2
4	4

12. Find $f(g(1))$ _____

13. Find $g(h(0))$ _____

14. Find the inverse of $f(x) = \dfrac{3x+2}{4}$ (show all your work).

15. Find functions f and g such that $f(g(x)) = H(x)$ (5 points)

$H(x) = \left(x^2 + 3\right)^5$

$g(x) =$ _____ and $f(x) =$ _____

16. Determine whether the function is **even odd or neither**: $f(x) = \dfrac{x^3}{x^4+1}$

17. Given the function $f(x) = 2x + 4$
    - find the inverse of the function showing all steps
    - Graph the function, the inverse and the identity function on the set of axis provided
    - Write out the domain and range for each of the three functions.

18. Given $f(x) = x^2 - 2x + 3$ find $f(x+h) - f(x)$. Show all work.

19. Graph the following functions **on the axis provided at the end of this packet**. Write out the domain and range using interval notation in the space provided.

    1. $f(x) = x$ ii) $f(x) = x^2$ iii) $f(x) = x^3$ iv) $f(x) = x^4$

    v) $f(x) = \sqrt{x}$ vi) $f(x) = \sqrt[3]{x}$ vii) $f(x) = \dfrac{1}{x}$

    viii) $f(x) = e^x$ $f(x) = \ln(x)$ and $f(x) = x$ on the same set of axis. What is the relationship between these 2 functions?

IX. Trigonometry:

1. Identify the quadrant in which the terminal side of the angle lies (or state the angle as a quadrantal if applicable) and convert the angle measure to radians.

   a. $-180°$ b. $640°$ c. $225°$ d. $60°$

2. Identify the quadrant in which the terminal side of the angle lies (or state the angle as a quadrantal if applicable) and convert the angle measure to degrees

   a. $\dfrac{3\pi}{7}$ **b.** $-\dfrac{11\pi}{4}$ **c.** 1 **d.** $-\dfrac{17\pi}{5}$

3. Find on positive and one negative co-terminal angle for each angle. Find the reference angle or identify the axis on which the terminal side of the angle lies and state the angle is a quadrantal angle.

a. $-240°$ **b.** $210°$ **c.** $\frac{11\pi}{3}$ **d.** $\frac{\pi}{6}$

4. Find the six trigonometric ratios of an angle in standard position if the point (-20, 21) lies on the terminal ray of the angle.

5. Find the six trigonometric rations of an angle in standard position if the point (0,-3) lies on the terminal ray of the angle.

6. Find the five remaining trigonometric ratios of an angle in standard position given the terminal ray lies in quadrant II.

7. Find the 5 trigonometric ratios of an angle in standard position if $\cot\theta = -1$

8. Convert the angle measured in degrees to an equivalent measure in radians

a. $270°$ **b.** $60°$ **c.** $135°$ **d.** $315°$

9. Convert the angle measure in radians to an equivalent measure in degrees.

a. $\frac{5\pi}{6}$ b. $\frac{\pi}{6}$ c. $\frac{7\pi}{4}$ d. π

10. Find the exact value of the trigonometric function of the angle.

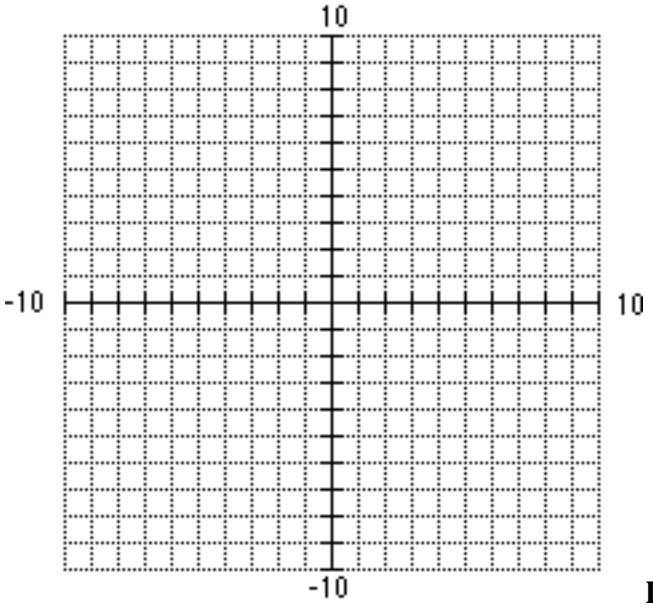
a. $\sin 150°$ b. $\cos 240°$ c.. $\tan 225°$ d. $\csc 120°$

e. $\cos\frac{4\pi}{3}$ f. $\sin\frac{8\pi}{3}$ g. $\sin\frac{3\pi}{4}$ h. $\cos\frac{17\pi}{6}$

X. Graphs of the Trigonometric Functions:

See axis at the end of this packet. Provide all information requested.

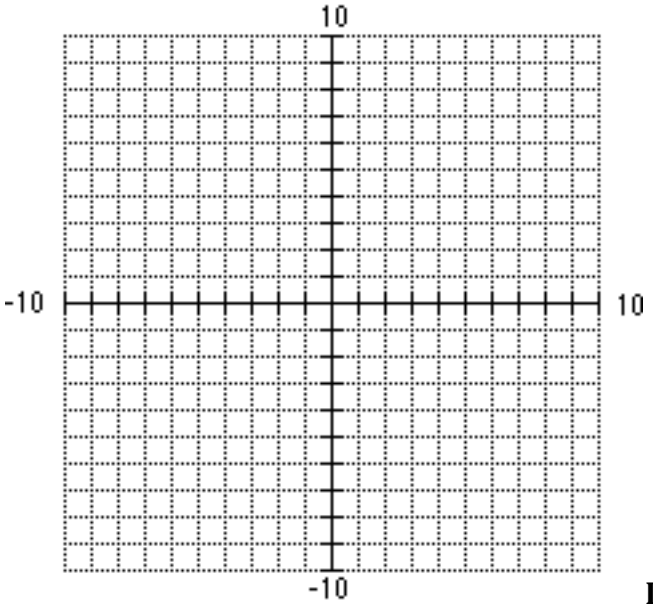
$f(x) = x$



Domain: _____

Range: _____

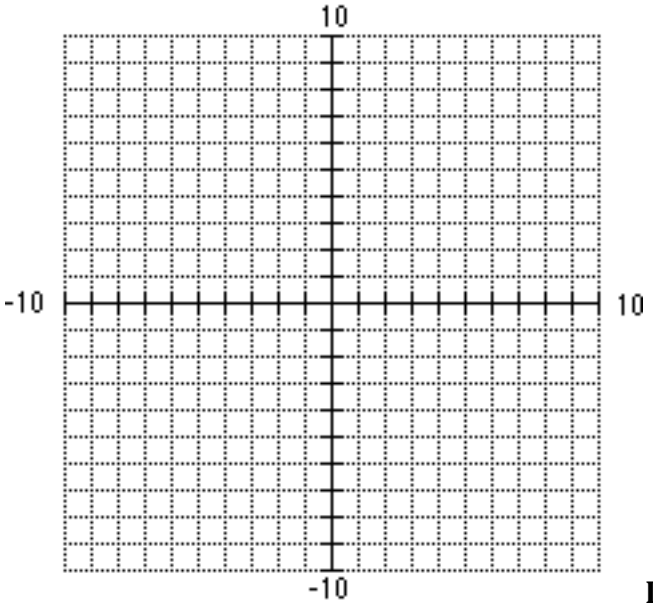
$f(x) = x^2$



Domain: _____

Range: _____

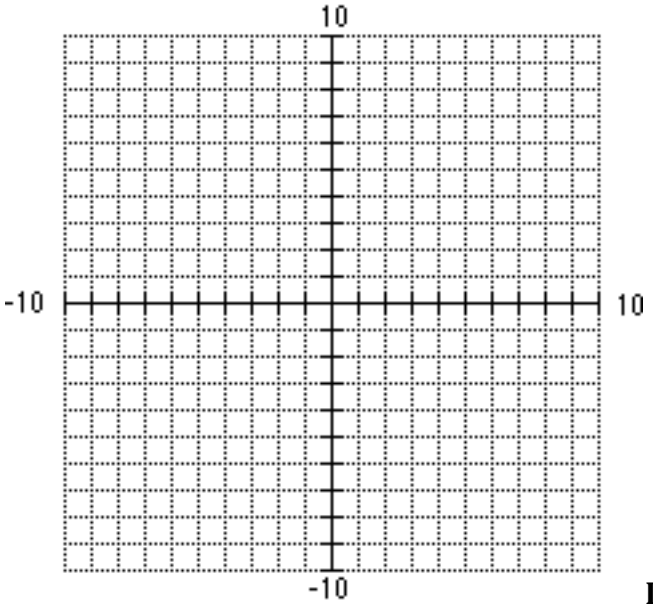
$f(x) = x^3$



Domain: _____

Range: _____

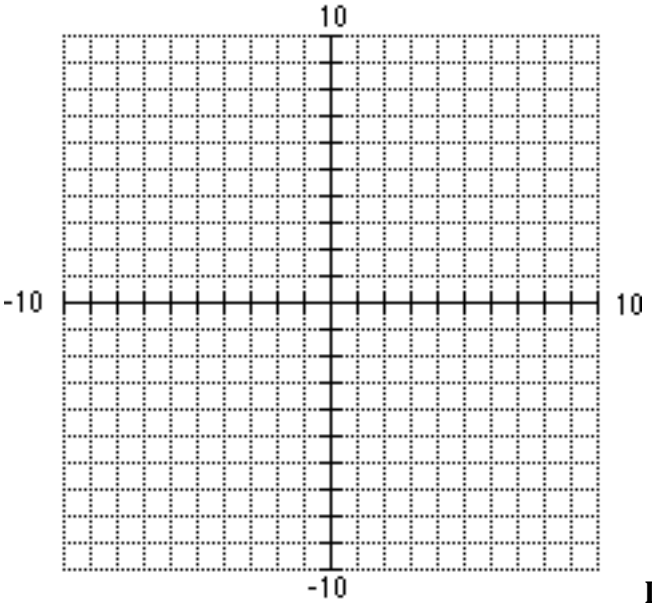
$f(x) = x^4$



Domain: _____

Range: _____

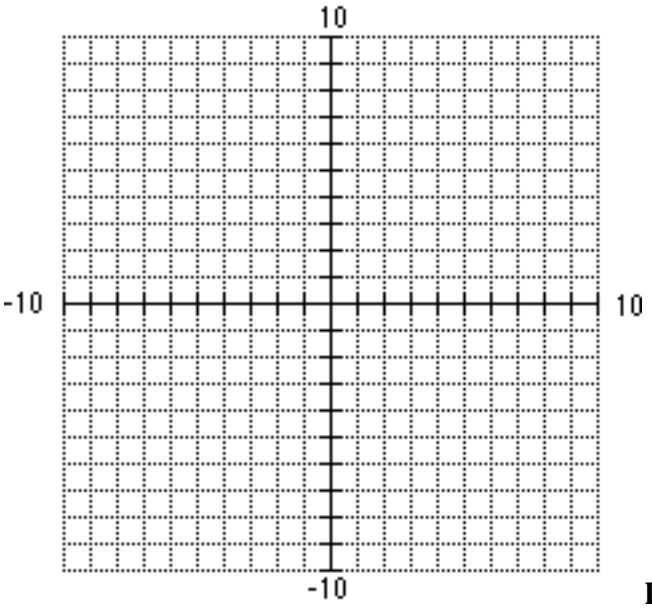
$f(x)=\sqrt{x}$



Domain: _____

Range: _____

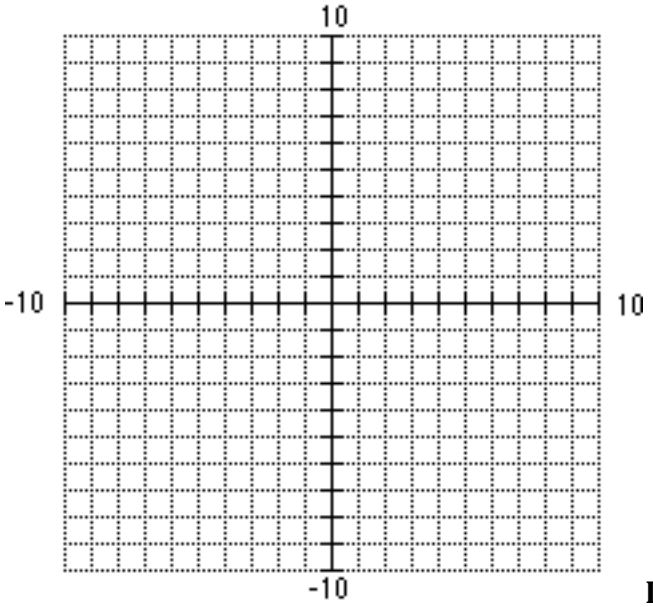
$f(x)=\sqrt[3]{x}$



Domain: _____

Range: _____

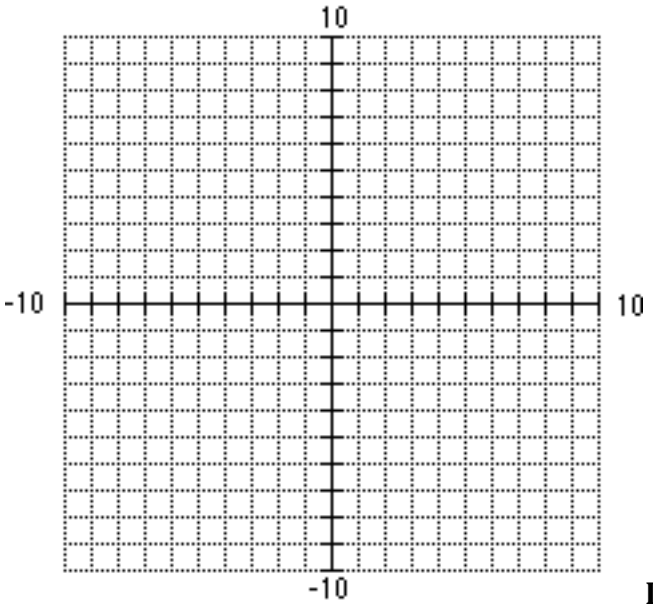
$f(x)=\frac{1}{x}$



Domain: _____

Range: _____

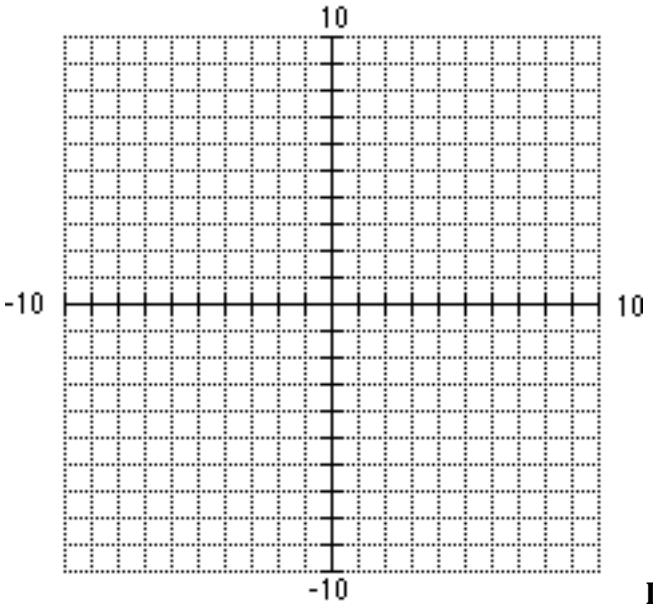
$f(x)=e^{x}$



Domain: _____

Range: _____

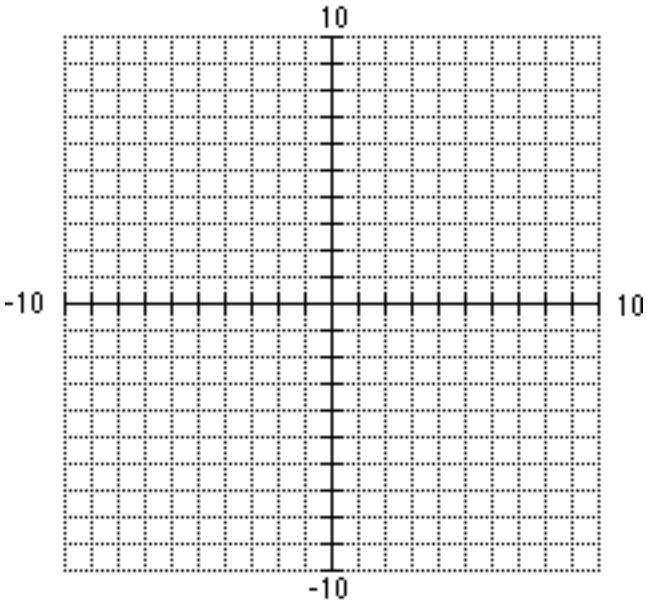
$f(x) = \ln(x)$



Domain: _____

Range: _____

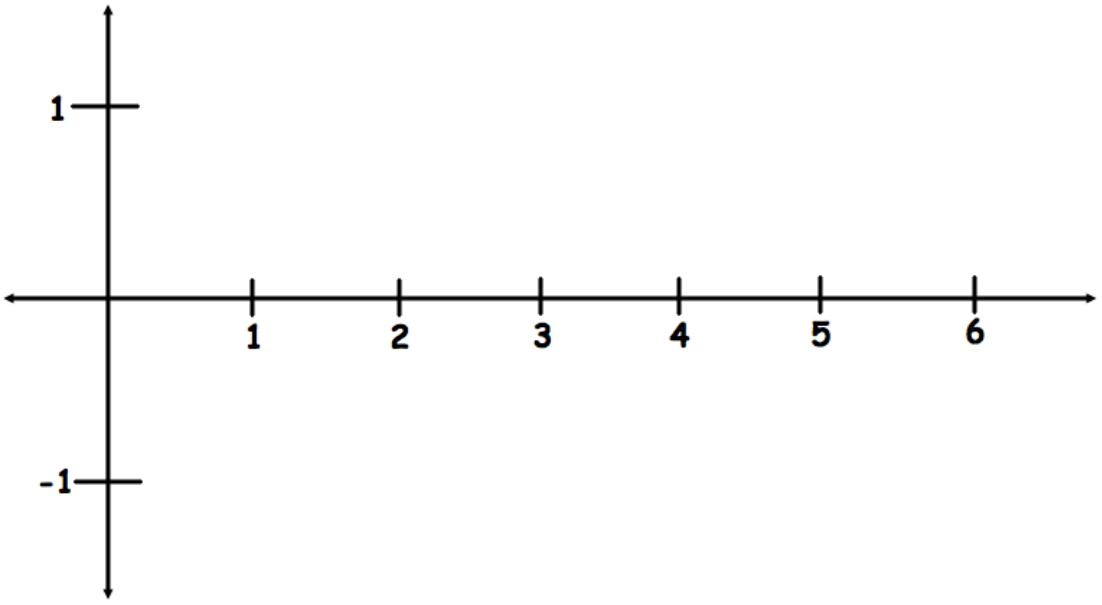
$f(x) = e^x$, $f(x) = x$ **and** $f(x) = \ln(x)$ **on same set of axis:**



What is the relationship between $f(x) = e^x$ **and** $f(x) = \ln(x)$

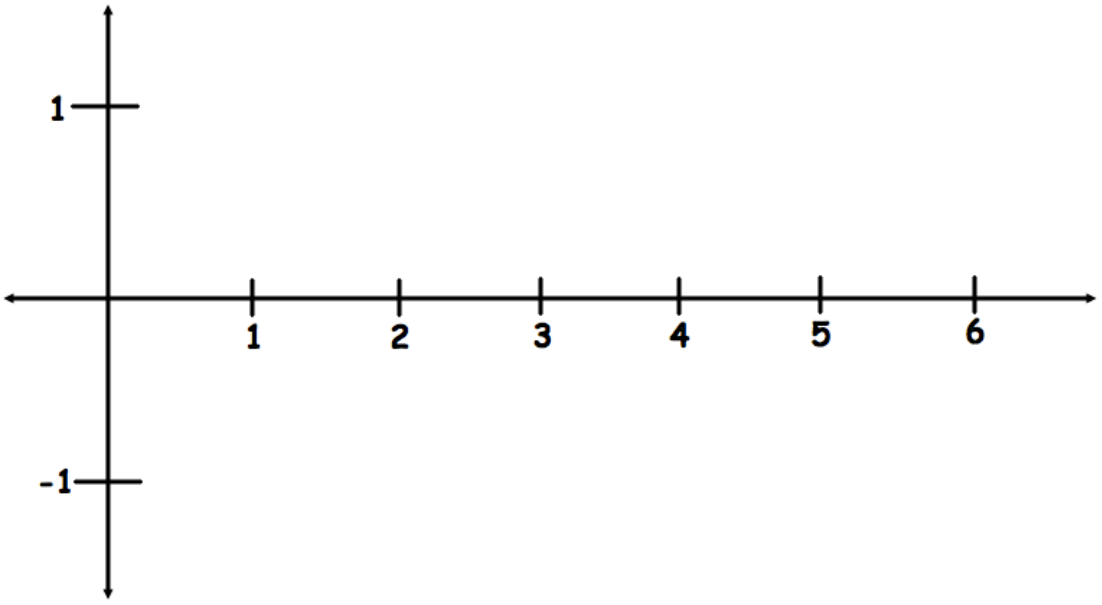
$y = \sin x$ **Domain:** _____ **Range:** _____

Period: _____ **Amplitude:** _____



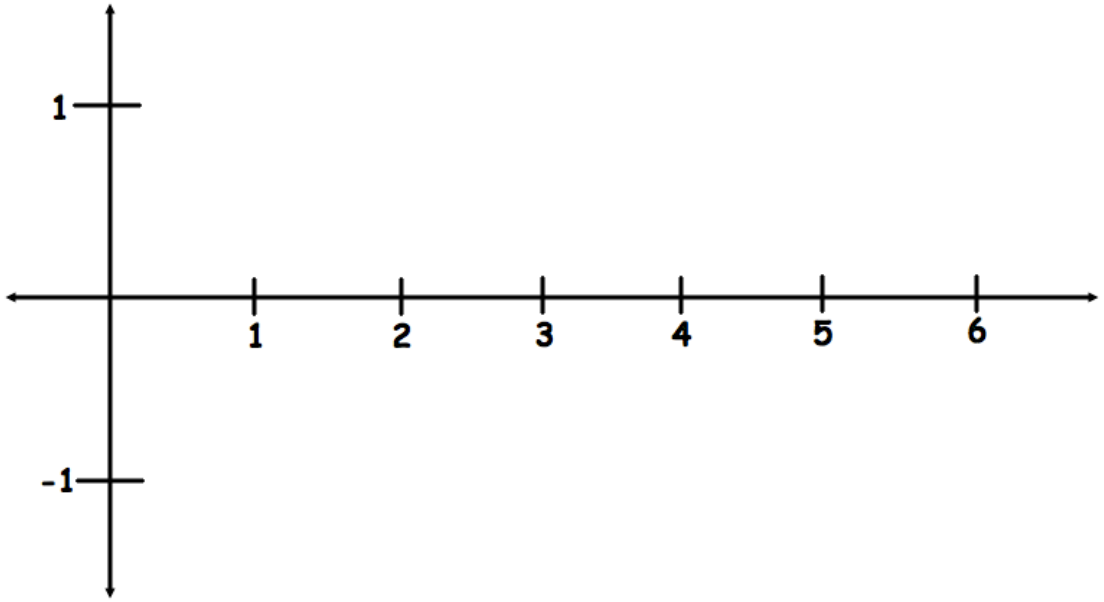
$y = \cos x$ **Domain:** _____ **Range:** _____

Period: _____ **Amplitude:** _____



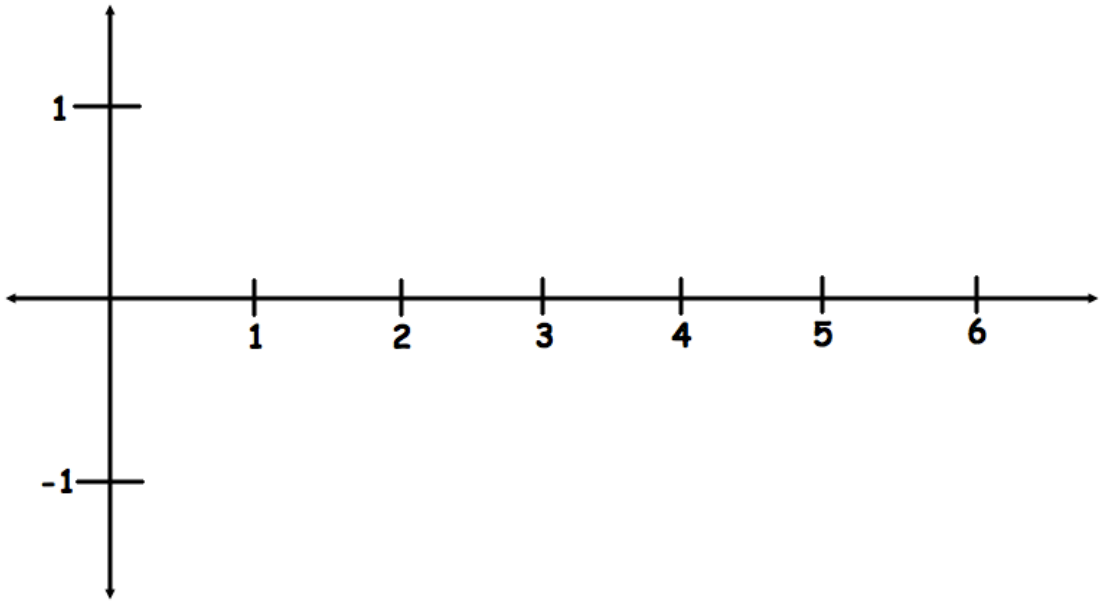
$y = \tan x$ **Domain:** _____ **Range:** _____

Period: _____ **Amplitude:** _____



$y = \csc x$ **Domain:** _____ **Range:** _____

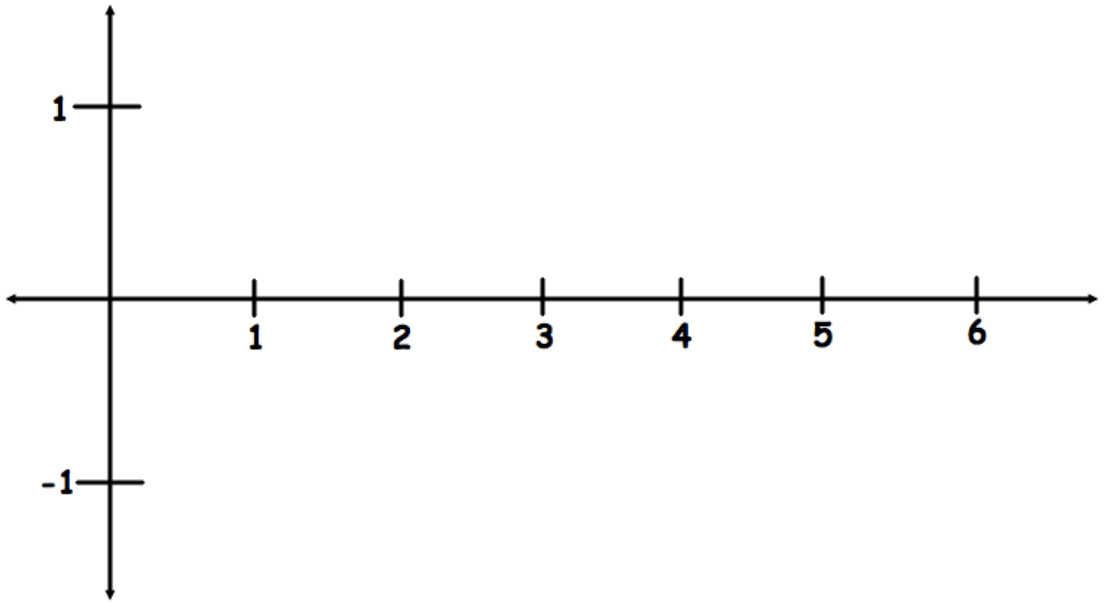
Period: _____ **Amplitude:** _____



$y = \sec x$

Domain: _____ **Range:** _____

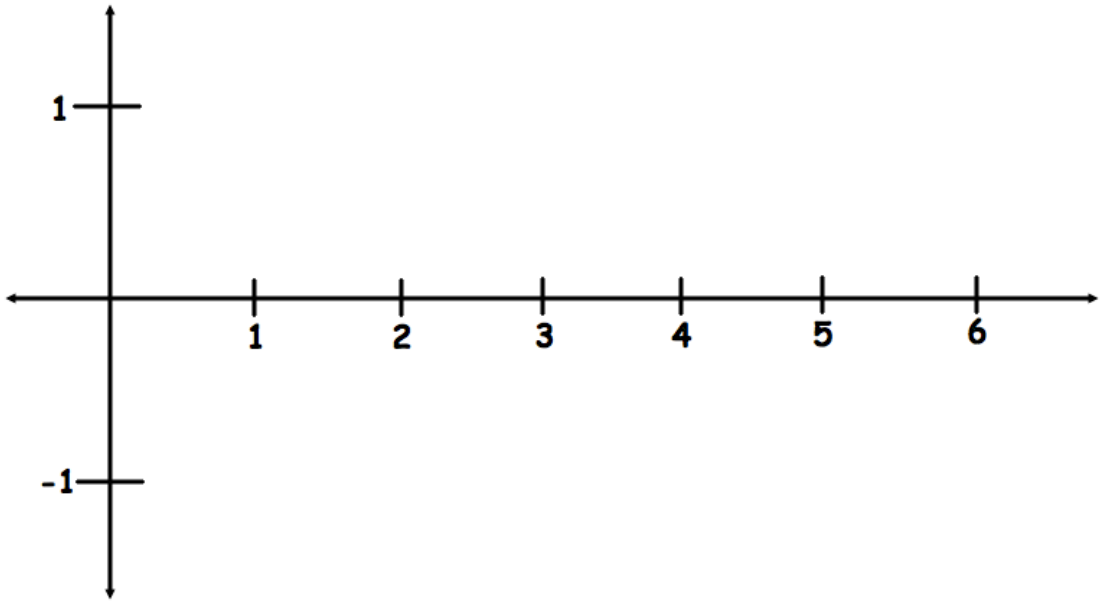
Period: _____ **Amplitude:** _____



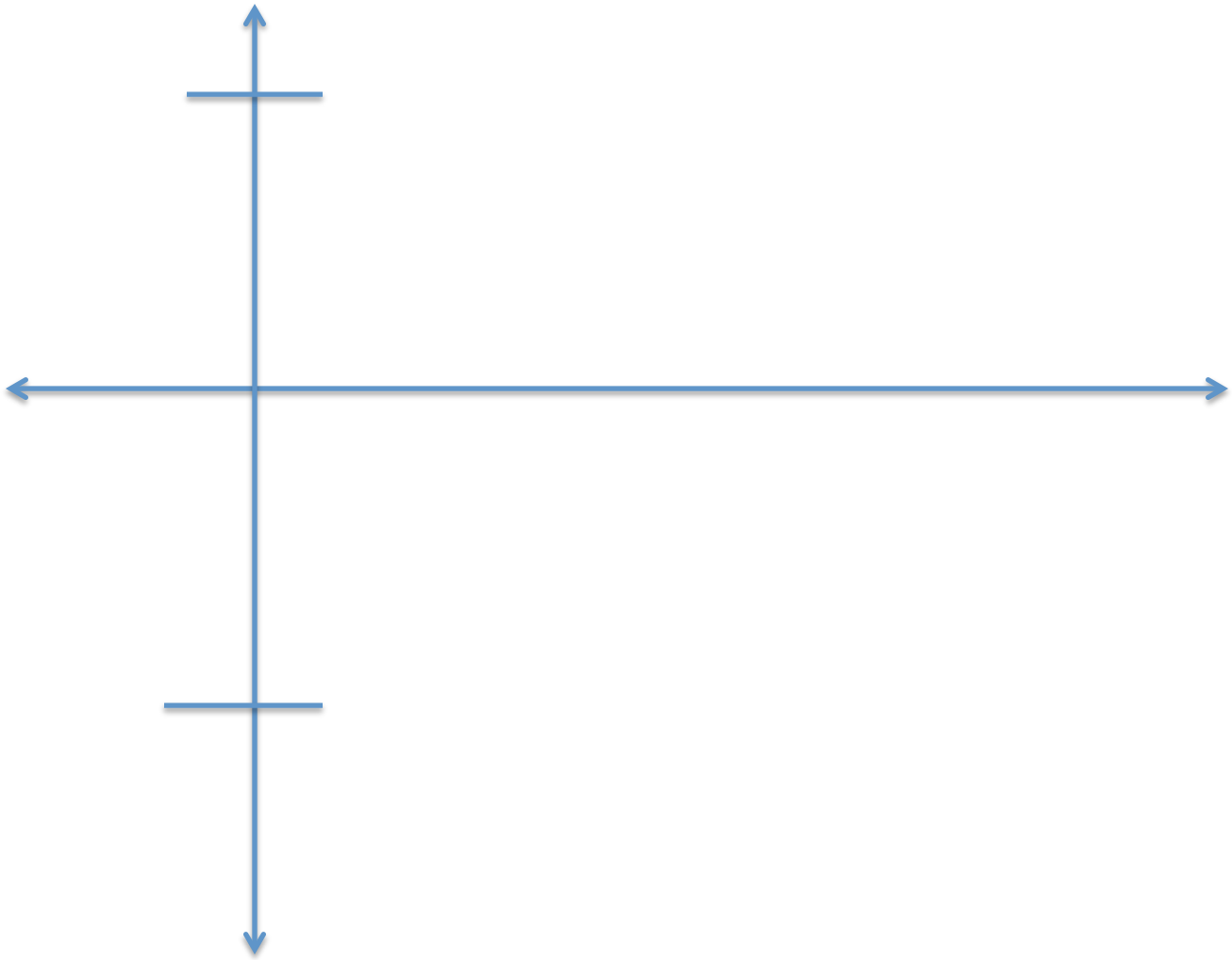
$y = \cot x$

Domain: _____ **Range:** _____

Period: _____ **Amplitude:** _____



$$y = \left(\frac{1}{2}\right)\sin 2(x-\pi) - 1$$



Domain: _____

Range:_____

Period; _____

Amplitude: _____

Resources:

(some free online websites that are pretty decent to review topics you might have forgotten)

1. **A neat and organized notebook from your prior math classes with corrected tests and quizzes is your greatest resources.**
2. **http://www.purplemath.com**
3. **http://www.khanacademy.org/**
4. **http://www.algebra-class.com/**
5. **http://www.themathpage.com/alg/algebra.htm**