

CALCULUS HONORS SUMMER ASSIGNMENT (Course Code: 5530)

NOTE THIS ASSIGNMENT IS MANDATORY



You are taking **Calculus Honors** in the fall. A mastery of and proficiency performing the following Algebra and Pre-Calculus skills will be necessary for success in a **Calculus Honors**. 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 must be completed in neat and orderly manner. You will be given a proficiency test within the first week of school on the topics in this assignment. This test grade will be included in your first quarter grade

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

Name: _____ Date: _____

Last Math Class Taken: _____

Teacher: _____

I. Factor each expression completely.

1. $x^2 + 3x - 10$

9. $18x^2 - 3x - 1$

17. $x^3 - 1$

2. $x^2 + 5x + 6$

10. $3x^2 - 4x - 15$

18. $x^3 + 64$

3. $x^2 + 8x + 15$

11. $9x^2 + 24x + 16$

19. $x^3 - y^3$

4. $x^2 + 4x + 4$

12. $6x^2 + 7x - 3$

20. $8x^3 - 27$

5. $2x^2 - 22x + 48$

13. $x^2 - y^2$

21. $16x^3 - 128$

6. $x^2 - 15x + 50$

14. $x^4 - y^4$

22. $x^3 - 9x$

7. $x^2 - 9x + 20$

15. $x^2 - 25$

23. $18x^3 - 34x^2 + 16x$

8. $2x^2 + 11x - 21$

16. $2x^2 - 32$

24. $x^4 - x^2$

II. Simplify each expression:

1.
$$\frac{\frac{x^2 + 2x + 1}{x + 1}}{3}$$

3.
$$\frac{\frac{2y}{y^2 - 4}}{3}$$

$$\frac{y^2 - 4y + 4}{y^2 - 4y + 4}$$

5.
$$\frac{x}{x - 2} - \frac{1}{x + 2}$$

2.
$$\frac{\frac{5x^2 - 20}{2x + 2}}{10x - 20}$$

$$4x$$

4.
$$\frac{\frac{x^2 + 7x}{3x}}{49 - x^2}$$

$$3x - 21$$

6.
$$\frac{3}{x - 2} - \frac{2}{x - 3}$$

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. $\frac{2x^{-2}y^2z}{6x^{-3}y^{-2}z}$

2. $2x^{-3}y^{-1}$

3. $\frac{3(2x)^3y^{-2}\sqrt{y}}{6xyz^{-3}}$

4. $3\sqrt{18} - 2\sqrt{50}$

5. $\frac{2xy^{-1}}{z} \left(\frac{3x^{-2}}{yz} \right)^3$

6. $\frac{(2x-6)}{4x+2} \cdot \frac{16x-4}{(x-3)}$

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. $\ln \frac{1}{e}$

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. $27^x = 9$

5. $8^x = 4$

8. $\ln(x + 3) = 2$

3. $4^x = \frac{1}{16}$

6. $8^x = 16$

9. $2e^x - 1 = 17$

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

11. $x^2 + 3x = 7$

12. $\frac{x-1}{x+6} = \frac{x-1}{2x-1}$

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 two 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 $f(x) = \frac{1}{x-4}$

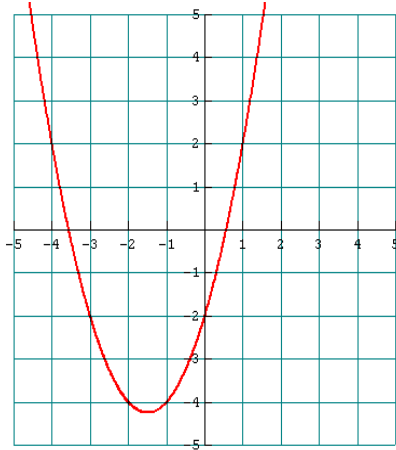
11. The table below shows the amount spent on student scholarships (in millions of dollars) by The College of New Jersey in recent years. **Is the relation a function? Justify your answer.**

Yes or No (circle one). Explain 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

Use the 3 functions represented below to answer questions 12 & 13.

$g(x)$ (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 $f(x) = \frac{3x+2}{4}$ (show all your work).

15. Find functions f and g such that $f(g(x)) = H(x)$ (5 points)
 $H(x) = (x^2 + 3)^5$

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

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

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 the difference quotient $\frac{f(x+h) - f(x)}{h}$. Show all work.

19. Graph the following functions **on the axis provided starting on page 11** in 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) $f(x) = \frac{1}{x}$

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. $\frac{3\pi}{7}$ b. $-\frac{11\pi}{4}$ c. 1 d. $-\frac{17\pi}{5}$
3. Find one 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 ratios 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. $\sin 150^\circ$ b. $\cos 240^\circ$ c. $\tan 225^\circ$ d. $\csc 120^\circ$
- 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 starting on page 15 in this packet. Provide all information requested.

XI. Limits:

1. Find the limits if they exist: (If they don't exist give the one sided limits)

a. $\lim_{x \rightarrow \infty} (-x^4 - 2x^2 - x + 3)$ b. $\lim_{x \rightarrow -\infty} (x^5 + x^4 - 3x^2 + x + 6)$ c. $\lim_{x \rightarrow -\infty} \frac{x^2 + 2x - 1}{x^2 - x - 6}$

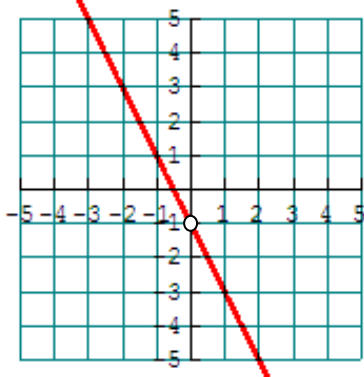
d. $\lim_{x \rightarrow \infty} \frac{x - 2}{x^2 - 2x + 1}$ e. $\lim_{x \rightarrow 2} (7x^3 - 5x^2 + 2x - 4)$ f. $\lim_{x \rightarrow 4} \frac{x^2 - x - 12}{x - 4}$

g. $\lim_{x \rightarrow 5} \frac{x - 3}{x^2 - 8x + 15}$ h. $\lim_{x \rightarrow 2} \frac{5x^2 - 7}{3x - 2}$ i. $\lim_{x \rightarrow \infty} \frac{3x^5 - 2x + 3}{2x^5 + 3x^2 - 2}$

XII. Each function is discontinuous at the point $x = a$. Write out the first condition for continuity that is not met. (12 pts: 3 each)

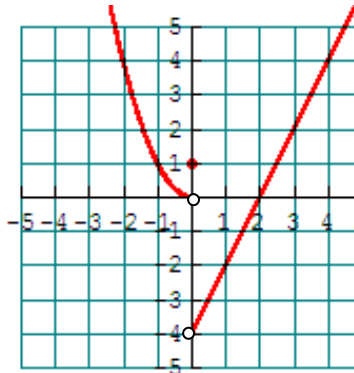
Use correct mathematical notation!

a. $a = 0$



b.

$a = 0$

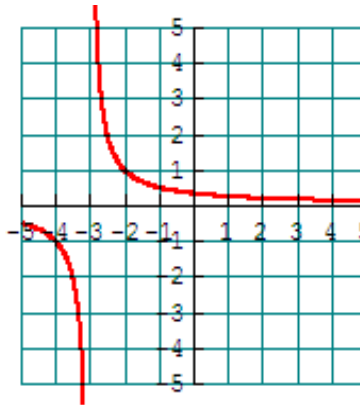
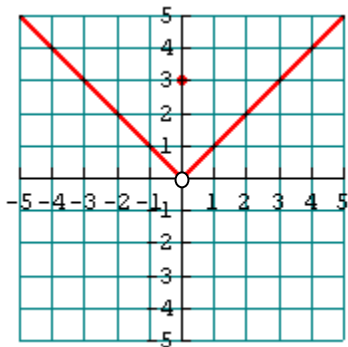


a. _____

b. _____

c. $a = 0$

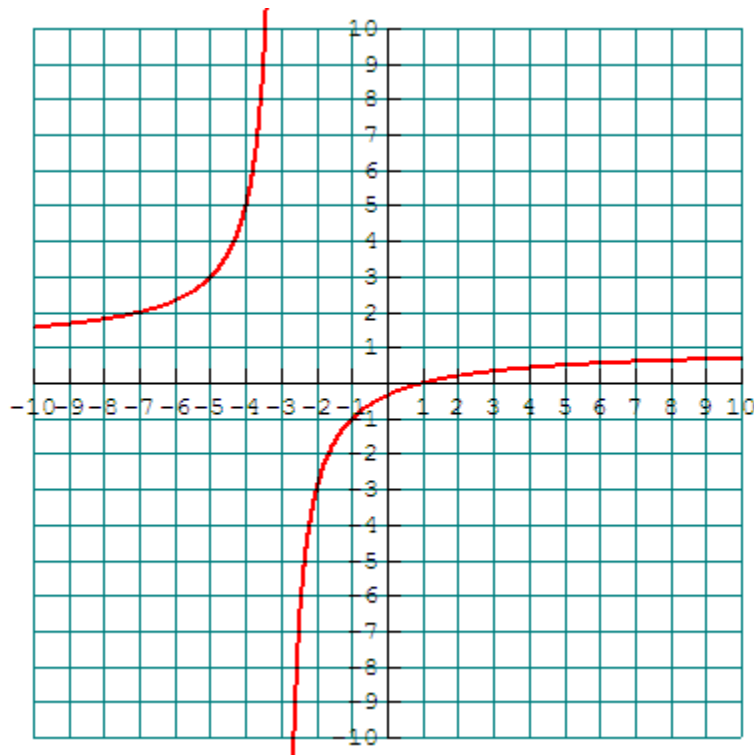
d. $a = -3$



c. _____

d. _____

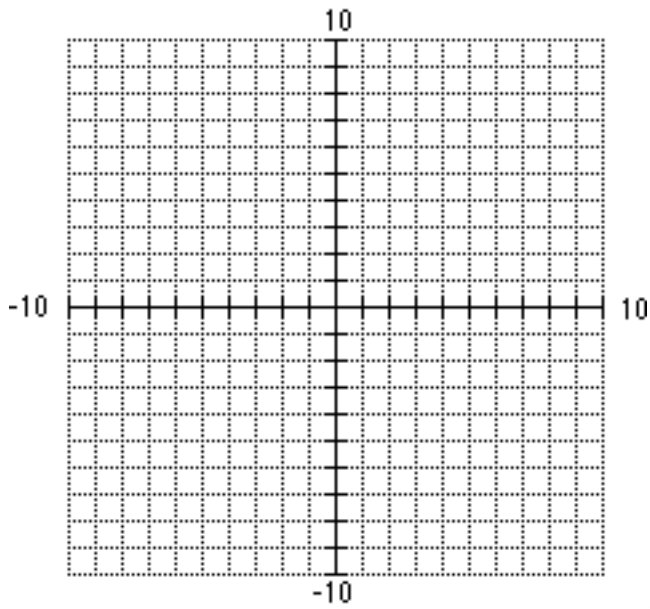
XIII. Consider the following function $R(x) = \frac{x^2 - 3x + 2}{x^2 + x - 6}$ and its graph below



- | | |
|--|--|
| a. $\lim_{x \rightarrow 2^-} R(x) =$ _____ | i. $\lim_{x \rightarrow -3^-} R(x) =$ _____ |
| b. $\lim_{x \rightarrow 2^+} R(x) =$ _____ | j. $\lim_{x \rightarrow -3^+} R(x) =$ _____ |
| c. $\lim_{x \rightarrow 2} R(x) =$ _____ | k. $\lim_{x \rightarrow -3} R(x) =$ _____ |
| d. $R(2) =$ _____ | l. $R(-3) =$ _____ |
| e. $\lim_{x \rightarrow 5^-} R(x) =$ _____ | m. $\lim_{x \rightarrow \infty} R(x) =$ _____ |
| f. $\lim_{x \rightarrow 5^+} R(x) =$ _____ | n. $\lim_{x \rightarrow -\infty} R(x) =$ _____ |
| g. $\lim_{x \rightarrow 5} R(x) =$ _____ | |
| h. $R(5) =$ _____ | |

AXES for Graphing

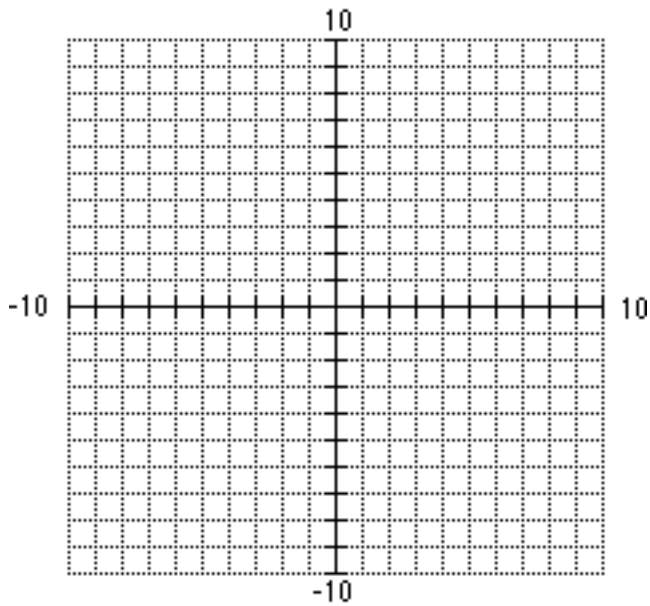
$$f(x) = x$$



Domain: _____

Range: _____

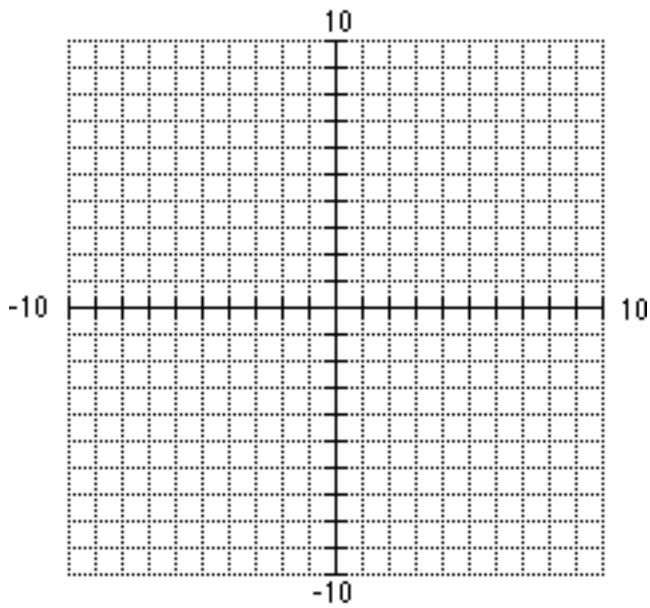
$$f(x) = x^2$$



Domain: _____

Range: _____

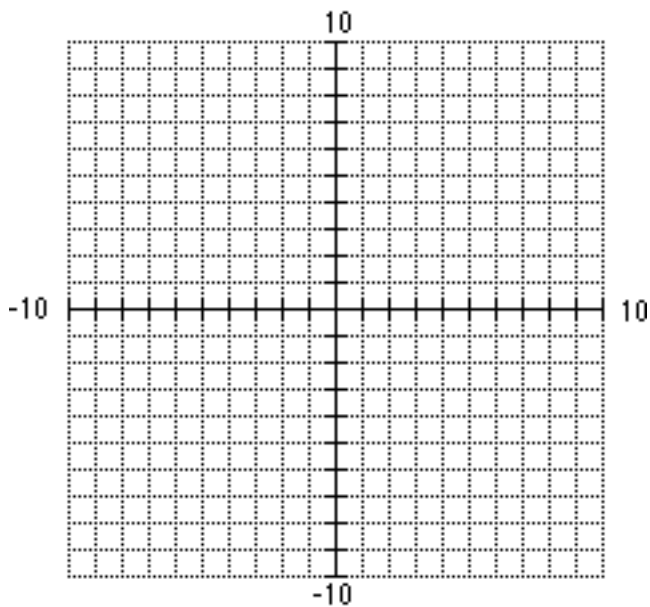
$$f(x) = x^3$$



Domain: _____

Range: _____

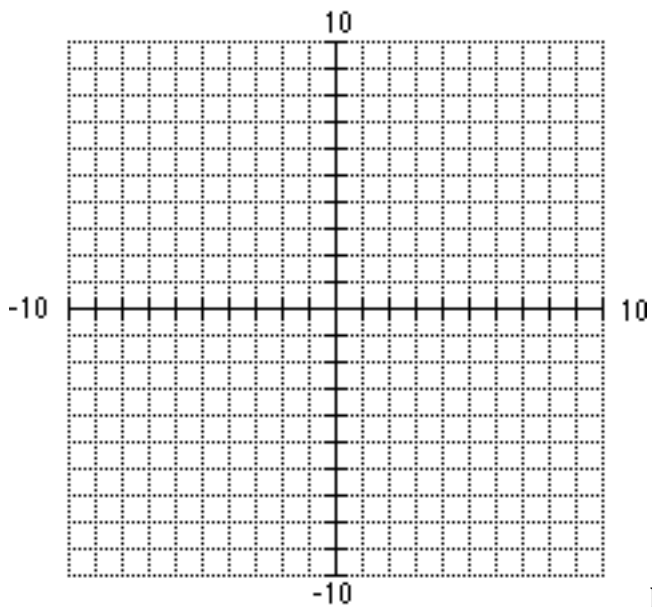
$$f(x) = x^4$$



Domain: _____

Range: _____

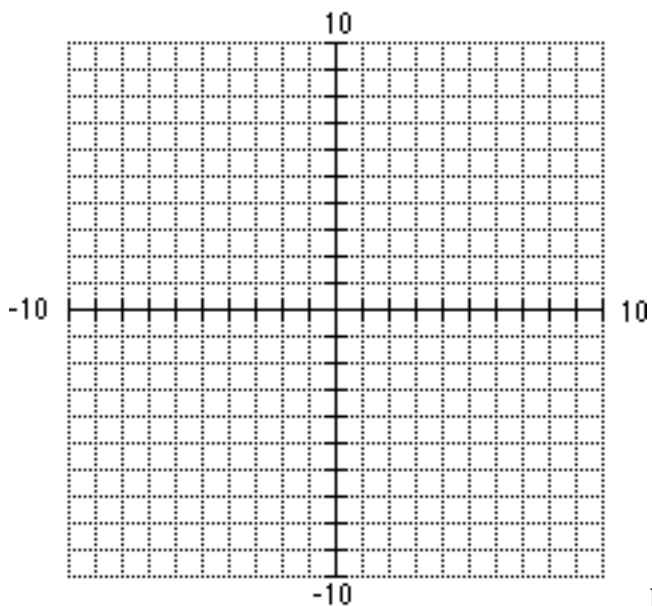
$$f(x) = \sqrt{x}$$



Domain: _____

Range: _____

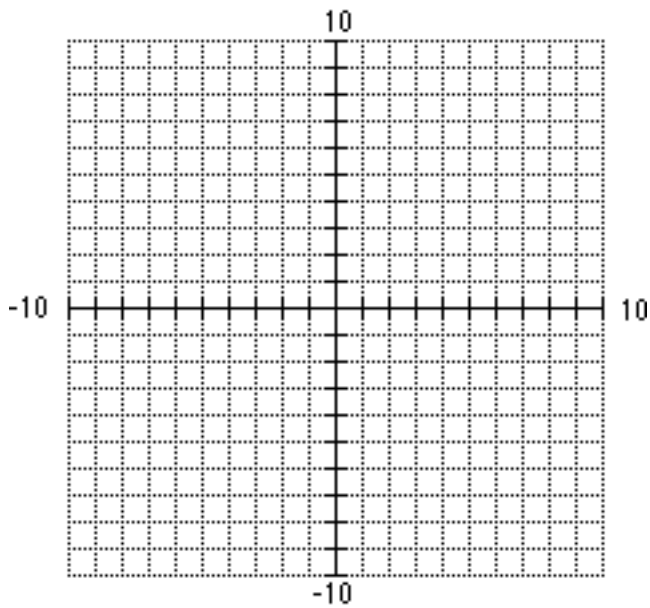
$$f(x) = \sqrt[3]{x}$$



Domain: _____

Range: _____

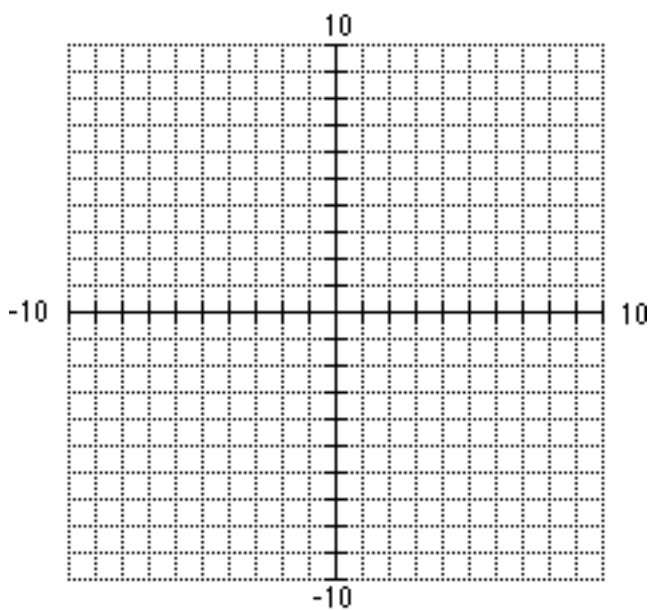
$$f(x) = \frac{1}{x}$$



Domain: _____

Range: _____

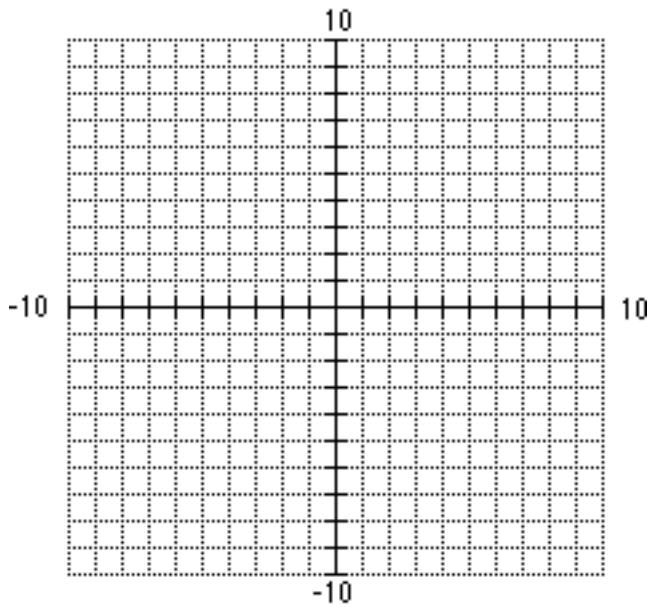
$$f(x) = e^x$$



Domain: _____

Range: _____

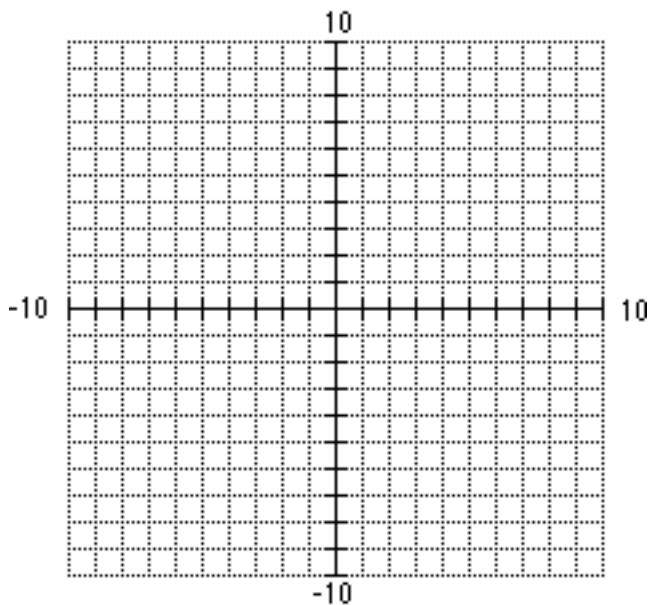
$$f(x) = \ln(x)$$



Domain: _____

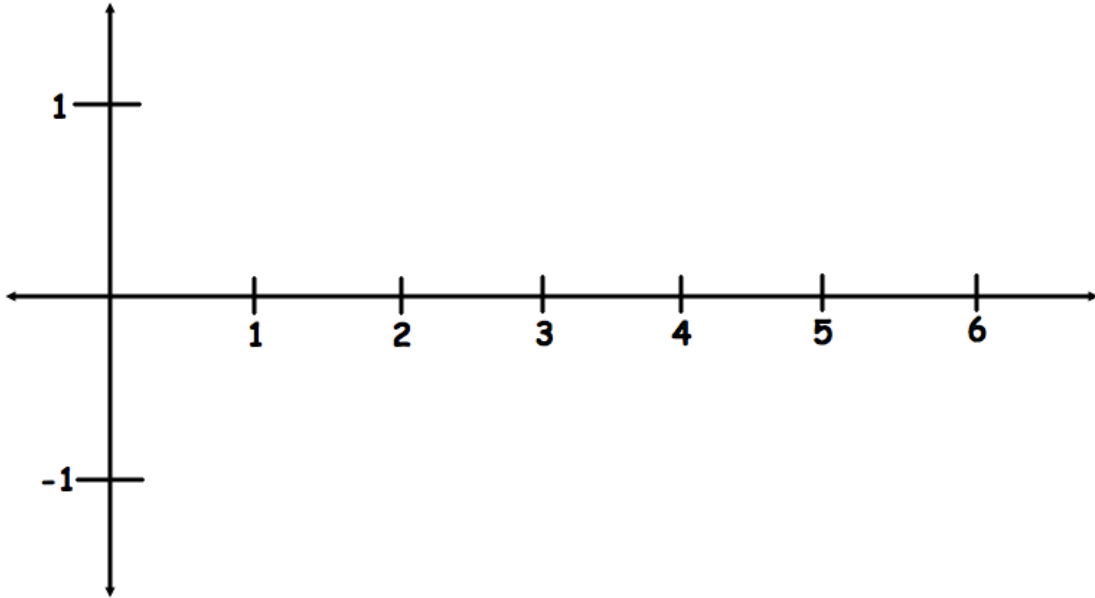
Range: _____

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

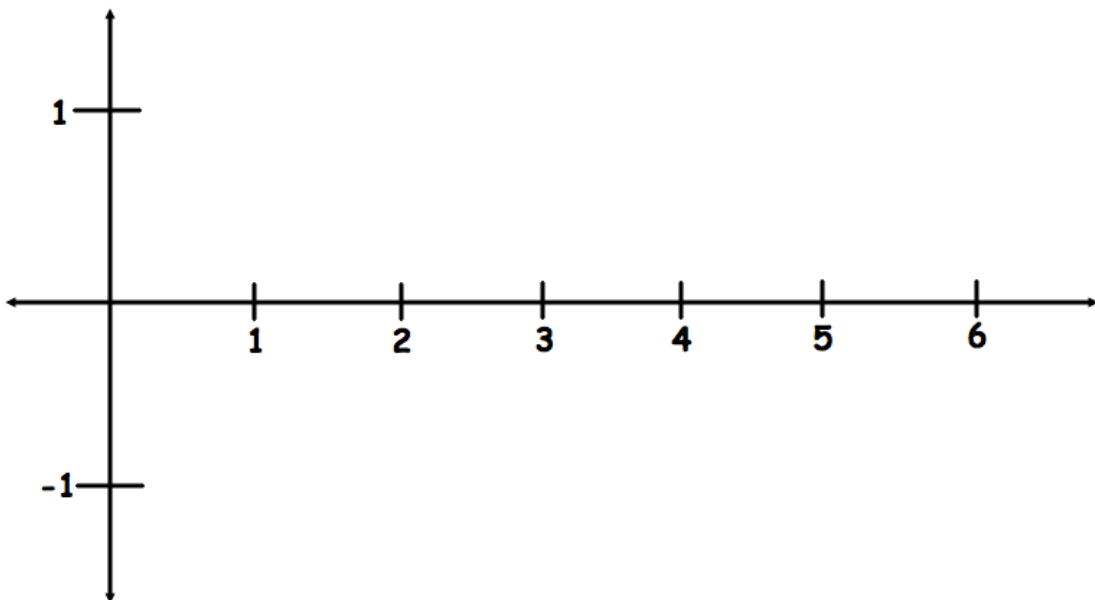


What is the relationship between $f(x) = e^x$ and $f(x) = \ln(x)$

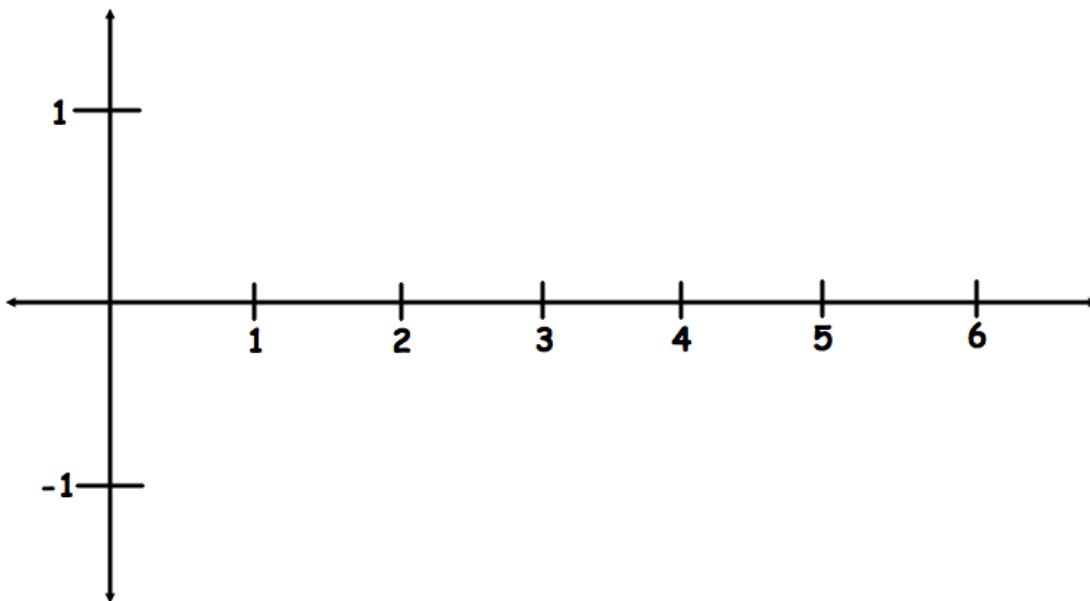
$y = \sin x$ Domain: _____ Range: _____
Period: _____ Amplitude: _____



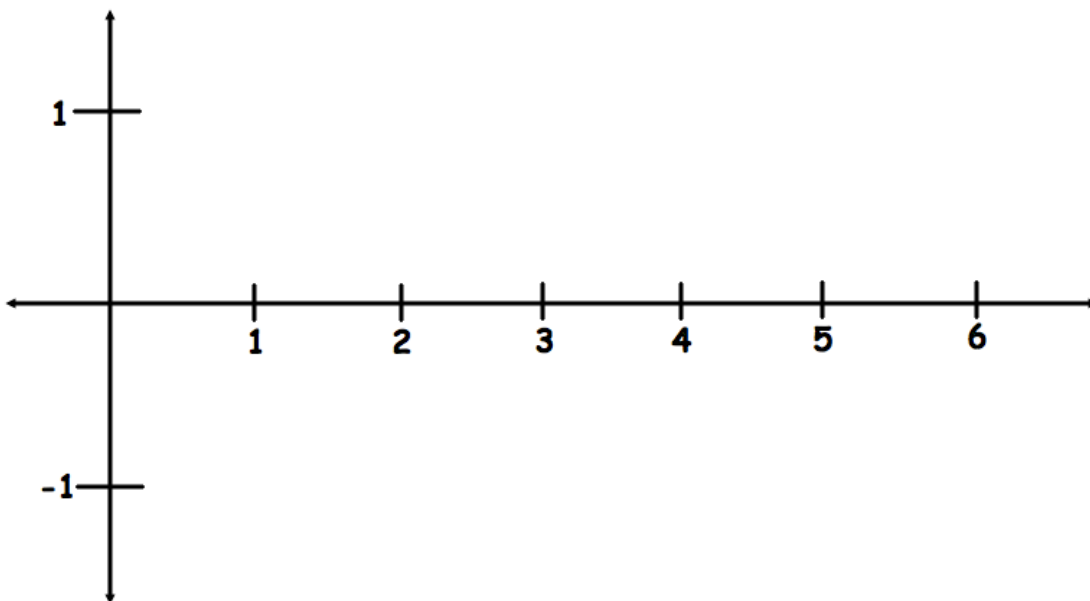
$y = \cos x$ Domain: _____ Range: _____
Period: _____ Amplitude: _____



$y = \tan x$ Domain: _____ Range: _____
Period: _____ Amplitude: _____



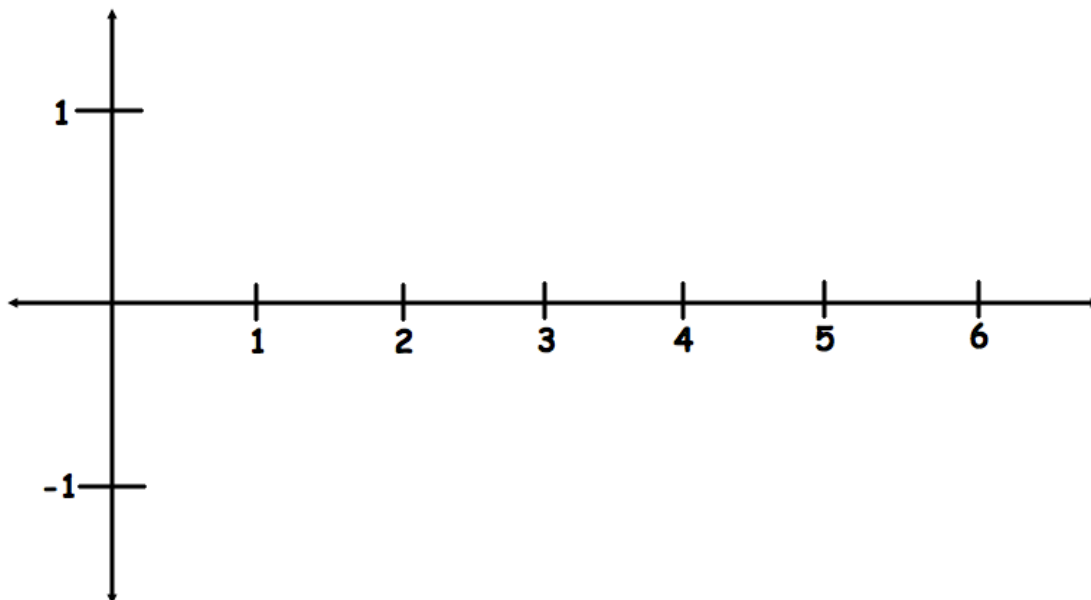
$y = \csc x$ Domain: _____ Range: _____
Period: _____ Amplitude: _____



$$y = \sec x$$

Domain: _____ Range: _____

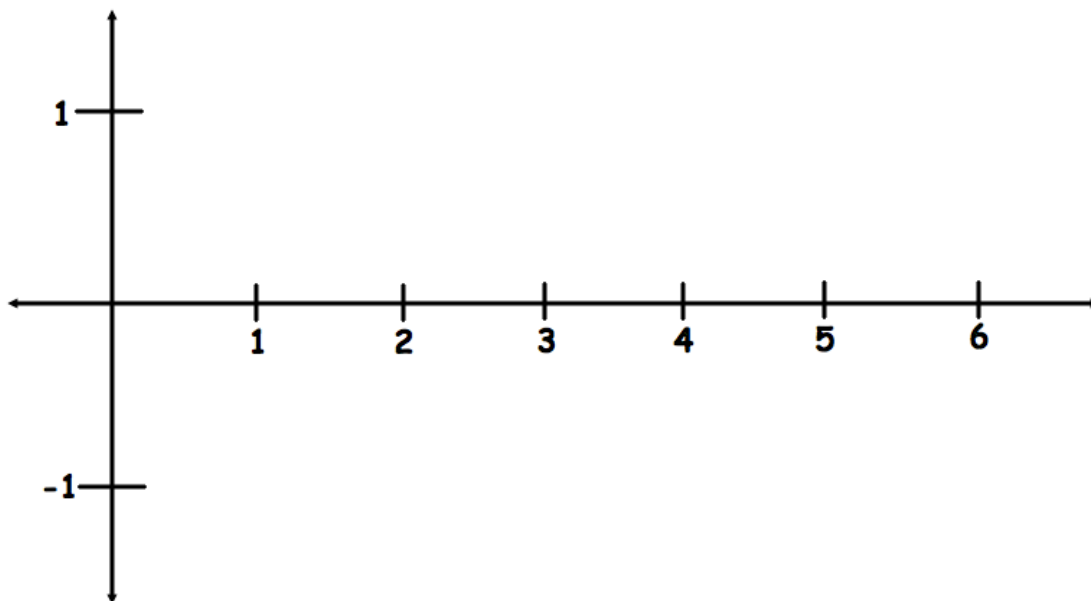
Period: _____ Amplitude: _____



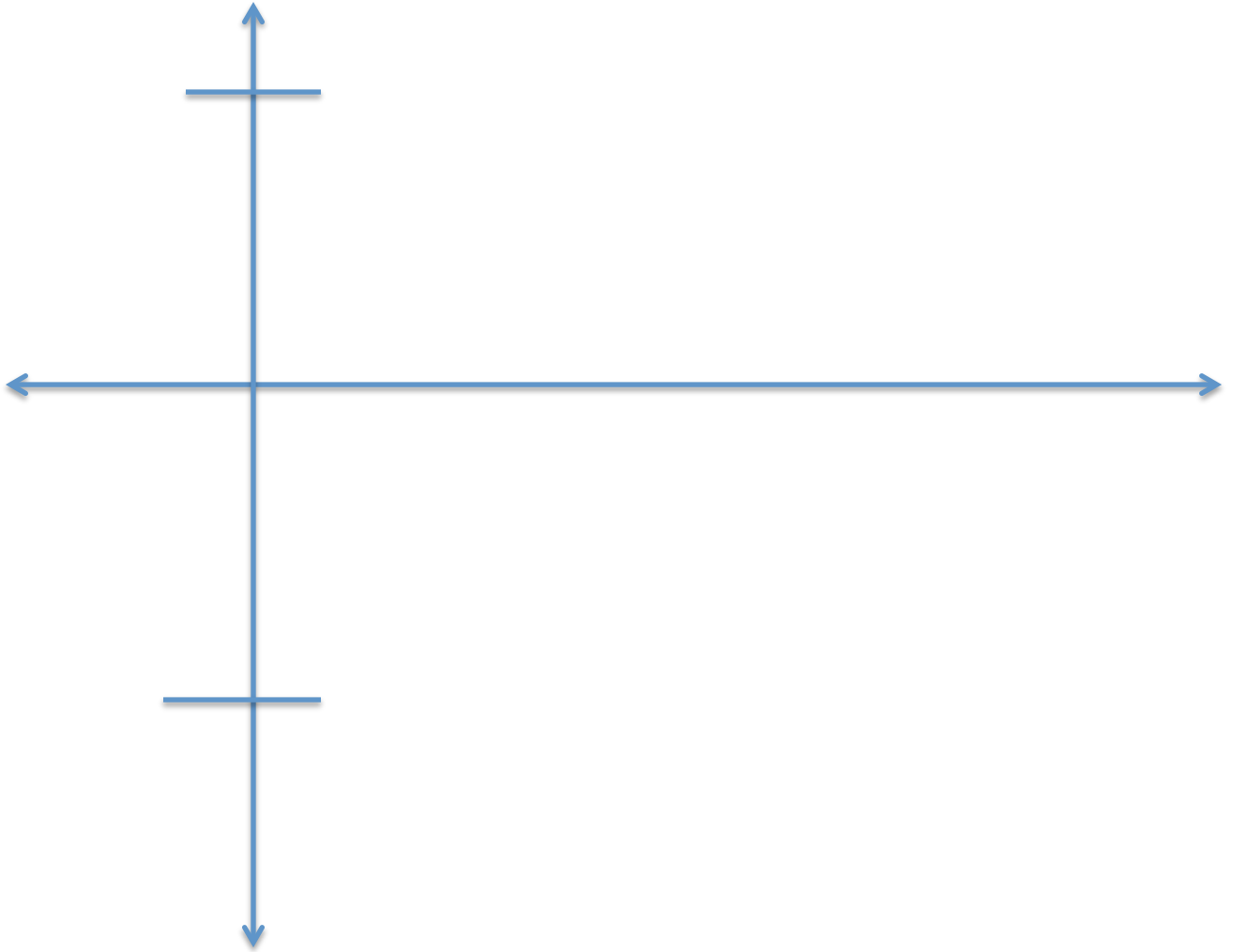
$$y = \cot x$$

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>