Calculus CP Summer Assignment

Welcome to Calculus CP! We are very excited to teach you next year! Calculus is a fun and challenging course. Most people who have taken Calculus in the past remember it as being their favorite type of math. If I were to guess the reason for this, it is because Calculus ties together all the math you have ever learned since your parents taught you to count to the last thing you learned last semester. Calculus where the narrative of math comes together. Most students who take Calculus do not find the concepts of Calculus to be particularly hard. When a student struggles in Calculus it is because they have forgotten something that was taught to them perhaps many years ago. In Calculus you need to be able to recall anything you have ever learned in math at the drop of a hat. Every student will hit a point in Calculus when they need to go back and review something that they are a little rusty on.

This Summer Assignment that you have before you is meant to do several things, one of which is to give you an opportunity to go back and review concepts you are a little rusty on. Please try to cultivate the skill of going back and practicing older, because you will have to do this during the course of next year. Another reason for this summer assignment is to prepare you for our first test of the year. **Our first test will be given on the first block day of the school year.** (Please see the JSerra Academic Calendar for this date, and know it is subject to change throughout the summer break.) **This summer packet will act as a study guide for the first test.** Please know that you may or may not be allowed a calculator on this test, so please make sure you can do everything in this packet both with and without a calculator. A third reason for this summer assignment is to ensure you are serious about taking Calculus CP. This Summer Assignment should be a lengthy, challenging, yet rewarding and enjoyable review for you. If you go through this packet and have a sense of pride and enjoyment in completing the challenge, you are in the right class and will have a great time learning the material of Calculus CP. If on the other hand you are going through this packet and you feel more of a sense of frustration because it is too long, too hard, too tedious, etc.… then perhaps Calculus CP is not the class for you and perhaps you may consider taking another math class that aligns more with your interests. Either way the choice is yours. **This assignment is due on the ~~first day of school~~ day of the first test (first block day of the year) without exceptions, no late work will be accepted. This assignment will be worth 50% of the first unit's homework grade.**

In this packet there are two sections of interest:

I. **Things to Know Before the First Day of Calculus CP**: A summary of all the things you will be expected to know/do on the first day and on any day/assignment/test/quiz/final.
II. **Summer Assignment Problems.** Complete all four parts of the summer assignment. Parts I-III should be done neatly, in pencil, on a separate sheet of paper. Please rewrite each problem and show all your work. Failure to follow this format will result in no points. In Part IV, you do not have to answer on a separate sheet of paper, but you do need to complete it in pencil and show all work for credit.

Things to Know Before the First Day of Calculus CP

It will be assumed that students know the following information and can complete the following tasks at the beginning of Calculus CP.

Holy Trinity of Algebra: All relations (including functions) can be expressed in three forms: Graphs, sets of solutions/ordered pairs, and equations. Students are able to fluidly move between each of these representations for the following types of functions with or without a calculator:

1. Polynomials (including Power Functions)
2. Rational Functions
3. Algebraic Functions (Created by adding, subtracting, multiplying, dividing, or taking a root of any number of polynomials.)
4. Exponential Functions
5. Logarithmic Functions
6. Trigonometric Functions
7. Inverse Trigonometric Functions

Factoring: Students should be able to factor a polynomial using the following factoring techniques without a calculator. Not every polynomial can be factored using these techniques; you will not be required to factor such polynomials.

1. Factoring a GCF from each term of a polynomial.
2. Grouping
3. Reverse FOIL
4. Difference of Squares
5. Difference of Cubes
6. Sum of Cubes
7. Completing the Square
8. Quadratic Formula
9. $\frac{p}{q}$ Method of Factoring

Functions and their properties: Students should have the following graphs memorized, including a point of interest and any asymptotes. If the function is periodic, students should have the period and amplitude memorized. Students should also be able to give domain and range for each. Students can do this with and without a calculator.

1. $y = x$ Point of interest: (0,0)
2. $y = x^{2n}, n \in \mathbb{N}$ Point of interest: (0,0)
3. $y = x^{2n+1}, n \in \mathbb{N}$ Point of interest: (0,0)
4. $y = \sqrt[2n]{x}, n \in \mathbb{N}$ Point of interest: (0,0)
5. $y = \sqrt[2n+1]{x}, n \in \mathbb{N}$ Point of interest: (0,0)

6. $y = b^x, b > 0, b \neq 1$ Point of interest: $(0,1)$, asymptotes: $y = 0$
7. $y = e^x$ Point of interest: $(0,1)$, asymptotes: $y = 0$
8. $y = \left(\frac{1}{b}\right)^x, b > 0, b \neq 1$ Point of interest: $(0,1)$, asymptotes: $y = 0$
9. $y = \log_b x, b > 0, b \neq 1$ Point of interest: $(1,0)$, asymptotes: $x = 0$
10. $y = \ln x, b > 0, b \neq 1$ Point of interest: $(1,0)$, asymptotes: $x = 0$
11. $y = \log_{\frac{1}{b}} x, b > 0, b \neq 1$ Point of interest: $(1,0)$, asymptotes: $x = 0$
12. $y = \frac{1}{x}$ Point of interest$(0,0)$, asymptotes: $y = 0$ and $x = 0$.
13. $y = \sin\ x$ Point of interest $(0,0)$, period: 2π, amplitude: 1
14. $y = \cos\ x$ Point of interest $(0,1)$, period: 2π, amplitude: 1
15. $y = \tan\ x$ Point of interest $(0,0)$, vert. asymptotes: where $\cos x = 0$, period: π
16. $y = \csc\ x$ Point of interest $(0,0)$, vert. asymptotes: where $\sin x = 0$, period:2π
17. $y = \sec\ x$ Point of interest $(0,0)$, vert. asymptotes: where $\cos x = 0$, period: 2π
18. $y = \cot\ x$ Point of interest $(0,0)$, vert. asymptotes: where $\sin x = 0$, period: π
19. $y = \arcsin\ x$ Point of interest $(0,0)$
20. $y = \arccos\ x$ Point of interest $(0,1)$
21. $y = \arctan\ x$ Point of interest $(0,0)$, asymptotes: $y = \pm\frac{\pi}{2}$

Transformations: Students should have the following transformations memorized. Given an equation, students should be able to graph any type of function above using the following transformations. Given a graph of any of the above functions, students should be able to derive the equation using these transformations. These should be done with and without a calculator.

Suppose $c > 0$:

$y = f(x) + c$, shift the graph $y = f(x)$ a distance of c units upward.
$y = f(x) - c$, shift the graph $y = f(x)$ a distance of c units downward.
$y = f(x - c)$, shift the graph $y = f(x)$ a distance of c units to the right.
$y = f(x + c)$, shift the graph $y = f(x)$ a distance of c units to the left.
$y = cf(x)$, stretch the graph $y = f(x)$ vertically by a factor of c.
$y = \frac{1}{c}f(x)$, compress the graph of $y = f(x)$ vertically by a factor of c.
$y = f(cx)$, compress the graph $y = f(x)$ horizontally by a factor of c.
$y = f\left(\frac{x}{c}\right)$, stretch the graph $y = f(x)$ horizontally by a factor of c.
$y = -f(x)$, reflect the graph $y = f(x)$ about the x −axis.
$y = f(-x)$, reflect the graph $y = f(x)$ about the y −axis.

Linear Functions: Students are familiar with the following formulas associated with lines. Students can work with linear functions with and without a calculator.

1. Slope: $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
2. Point-Slope Form: $y - y_1 = m(x - x_1)$

3. Slope Intercept Form: $y = mx + b$
4. x −Intercept: $(a, 0)$
5. y −Intercept: $(0, b)$

Quadratic Functions: Students are familiar with the following formulas associated with Quadratic Functions. Students can work with quadratic functions with and without a calculator.

1. Descending Form (sometimes called standard form): $f(x) = ax^2 + bx + c$
2. Standard Form (sometimes called vertex form): $f(x) = a(x - h)^2 + k$
3. Vertex: (h, k)
4. Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Polynomial Functions: Given any set of polynomial functions, students can determine the following. Students can work with polynomial functions with and without a calculator.

1. Find the Product, Sum, Difference, Quotient, and any roots of the set of polynomials.
2. Students can determine the domain and range.
3. The degree of the polynomial.
4. The maximum number of roots the polynomial has.
5. Irrational roots occur in conjugate pairs.
6. Imaginary roots occur in conjugate pairs.
7. If the polynomial is reasonably factorable (see *Factoring* above), students can determine what intervals the polynomial will yield positive and negative values.
8. End behavior of the polynomial.

Rational Functions: Given any set of rational functions, students can determine the following. Students can work with rational functions with and without a calculator.

1. Find the Product, Sum, Difference, Quotient, and any roots of the set of rational functions.
2. Students can determine the domain and range of a rational function.
3. If the numerator and denominators of the rational functions reasonably factorable (see *Factoring* above), students can simplify the rational function.
4. If the numerator and denominators of the rational functions reasonably factorable (see *Factoring* above), students can determine what intervals the polynomial will yield positive and negative values.
5. End behavior of the rational function.

Radical Functions: Given any set of rational functions, students can determine the following. Students can work with rational functions with and without a calculator.

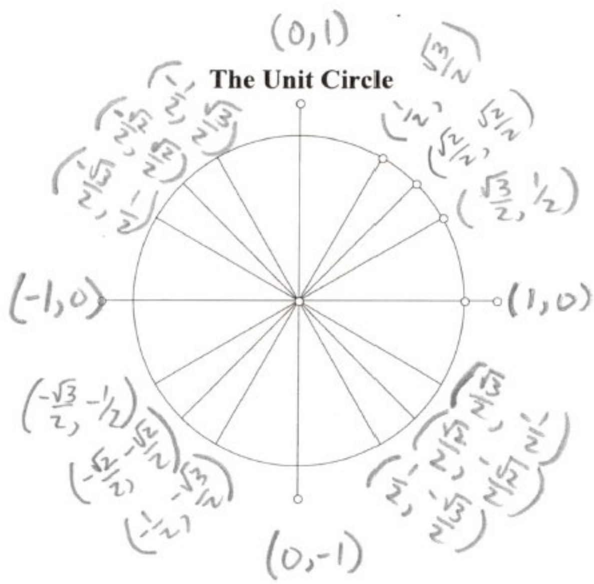
1. Find the Product, Sum, Difference, Quotient, and any roots of the set of radical functions.
2. Students can determine the domain and range of a radical function.
3. If the radicand of the radical function is reasonably factorable (see *Factoring* above), students can simplify the radical function.
4. If the radicand of the radical function is reasonably factorable (see *Factoring* above), students can determine what intervals the polynomial will yield positive and negative values.

5. If a rational function has a radical function as the denominator, students are able to rationalize the denominator.
6. End behavior of the rational function.

Trigonometric Formulas: Students have the following formulas memorized:

1. $\sin\theta = \frac{opp}{hyp} = \frac{y}{r}$
2. $\cos\theta = \frac{adj}{hyp} = \frac{x}{r}$
3. $\tan\theta = \frac{opp}{adj} = \frac{y}{x} = \frac{\sin\theta}{\cos\theta}$
4. $\csc\theta = \frac{hyp}{opp} = \frac{r}{y} = \frac{1}{\sin\theta}$
5. $\sec\theta = \frac{hyp}{adj} = \frac{r}{x} = \frac{1}{\cos\theta}$
6. $\cot\theta = \frac{adj}{opp} = \frac{x}{y} = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$
7. $\sin^2\theta + \cos^2\theta = 1$
8. $1 + \cot^2\theta = \csc^2\theta$
9. $1 + \tan^2\theta = \sec^2\theta$

The Unit Circle: Students have the following information about the Unit Circle memorized.



m^R	m^θ	cos θ	sin θ	tan θ	sec θ	csc θ	cot θ
0	$0°$	1	0	0	1	undef.	undef.
$\pi/6$	$30°$	$\sqrt{3}/2$	$1/2$	$\sqrt{3}/3$	$2\sqrt{3}/3$	2	$\sqrt{3}$
$\pi/4$	$45°$	$\sqrt{2}/2$	$\sqrt{2}/2$	1	$\sqrt{2}$	$\sqrt{2}$	1
$\pi/3$	$60°$	$1/2$	$\sqrt{3}/2$	$\sqrt{3}$	2	$2\sqrt{3}/3$	$\sqrt{3}/3$
$\pi/2$	$90°$	0	1	undef.	undef.	1	0
$2\pi/3$	$120°$	$-1/2$	$\sqrt{3}/2$	$-\sqrt{3}$	-2	$2\sqrt{3}/3$	$-\sqrt{3}/3$
$3\pi/4$	$135°$	$-\sqrt{2}/2$	$\sqrt{2}/2$	-1	$-\sqrt{2}$	$\sqrt{2}$	-1
$5\pi/6$	$150°$	$-\sqrt{3}/2$	$1/2$	$-\sqrt{3}/3$	$-2\sqrt{3}/3$	2	$-\sqrt{3}$
π	$180°$	-1	0	0	-1	undef.	undef.
$7\pi/6$	$210°$	$-\sqrt{3}/2$	$-1/2$	$\sqrt{3}/3$	$-2\sqrt{3}/3$	-2	$\sqrt{3}$
$5\pi/4$	$225°$	$-\sqrt{2}/2$	$-\sqrt{2}/2$	1	$-\sqrt{2}$	$-\sqrt{2}$	1
$4\pi/3$	$240°$	$-1/2$	$-\sqrt{3}/2$	$\sqrt{3}$	-2	$-2\sqrt{3}/3$	$\sqrt{3}/3$
$3\pi/2$	$270°$	0	-1	undef.	undef.	-1	0
$5\pi/3$	$300°$	$1/2$	$-\sqrt{3}/2$	$-\sqrt{3}$	2	$-2\sqrt{3}/3$	$-\sqrt{3}/3$
$7\pi/4$	$315°$	$\sqrt{2}/2$	$-\sqrt{2}/2$	-1	$\sqrt{2}$	$-\sqrt{2}$	-1
$11\pi/6$	$330°$	$\sqrt{3}/2$	$-1/2$	$-\sqrt{3}/3$	$2\sqrt{3}/3$	-2	$-\sqrt{3}$

Trigonometric Identities:

$$\sin(2x) = 2\sin x\cos x$$
$$\cos(2x) = \cos^2 x - \sin^2 x$$
$$\cos(2x) = 2\cos^2 x - 1$$
$$\cos(2x) = 1 - 2\sin^2 x$$
$$\sin^2 x = \frac{1-\cos 2x}{2}$$
$$\cos^2 x = \frac{1+\cos 2x}{2}$$

$$\sin^2 x + \cos^2 x = 1$$
$$1 + \tan^2 x = \sec^2 x$$
$$1 + \cot^2 x = \csc^2 x$$
$$\sec x = \frac{1}{\cos x}$$
$$\csc x = \frac{1}{\sin x}$$

$$\sin(-x) = -\sin(x)$$
$$\cos(-x) = \cos(x)$$
$$\tan(-x) = -\tan(x)$$
$$\cot(-x) = -\cot(x)$$
$$\sec(-x) = \sec(x)$$
$$\csc(-x) = -\csc(x)$$

Summer Assignment Problems

PART I: For questions 1-7 Please complete on a separate sheet of paper. Using pencil, rewrite the original problem and show all work. Failure to follow this format will result in no credit for this part.

Solve the following inequalities. You should be able to do this with and without a calculator.

1) $x^2 - x - 6 > 0$

2) $x^2 - 2x - 5 \geq 3$

3) $x^3 - 4x < 0$

For each of the following (problems 4-7).

a) Sketch the graph of $f(x)$

b) Sketch the graph of $|f(x)|$

c) Sketch the graph of $f(|x|)$

d) Sketch the graph of $f(2x)$

e) Sketch the graph of $2f(x)$

You may use your calculator to help you; however, ultimately you should be able to graph any of these functions without the use of a calculator.

4) $f(x) = 2x + 3$

5) $f(x) = x^2 - 5x - 3$

6) $f(x) = 2\sin(3x)$

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

PART II: On a separate sheet of paper, prove the following trigonometric identities by showing that the left side is equal to the right side. Using pencil, rewrite the original problem and show all work. Failure to follow this format will result in no credit for this part.

1. $\sin\theta = \cos\theta\tan\theta$

2. $\dfrac{1}{\cos\theta} = \dfrac{\tan\theta}{\sin\theta}$

3. $\sin^2\theta - \cos^2\theta = 1 - 2\cos^2\theta$

4. $\tan^2\theta + 1 = \dfrac{1}{\cos^2\theta}$

5. $1 - \cos^2\theta = \sin\theta\cos\theta\tan\theta$

6. $\cos^2\theta\tan^2\theta = \sin^2\theta$

7. $\sin\theta\tan\theta + \cos\theta = \dfrac{1}{\cos\theta}$

8. $\dfrac{\tan^2\theta}{\sin^2\theta} - 1 = \tan^2\theta$

9. $\cos^2\theta(1 + \tan^2\theta) = 1$

10. $\dfrac{1}{\cos^2\theta} = \tan^2\theta + 1$

11. $\sin^2\theta - \cos^2\theta = 2\sin^2\theta - 1$

12. $1 + \cos^2\theta = 2\cos^2\theta + \sin^2\theta$

13. $\tan^2\theta - \sin^2\theta = \tan^2\theta\sin^2\theta$

14. $\sin\theta(1+\tan\theta) = \tan\theta(\sin\theta+\cos\theta)$

PART III: Answer the following questions on a separate sheet of paper. Using pencil, rewrite the original problem and show all work. Failure to follow this format will result in no credit for this part.

IV. Solving Equations and Factoring

5. Solve for y' in *simplest form*.

a. $xy' + y = 1 + y'$ b. $3y^2y' + 2yy' = 5y' + 2x$ c. $3x^2yy' + 2xy^2 = 2yy'$

6. Solve the quadratic equation. Use any means from algebra: factoring, quadratic formula, graphing. Be sure answers are simplified.

a. $4x^2 - 21x - 18 = 0$ b. $2x^2 - 3x + 3 = 0$ c. $x^4 - 9x^2 + 8 = 0$

7. Factor completely (There should be no fractional or negative exponents.)

a. $3x^3 + 192$ b. $9x^2 - 3x - 2$ c. $2\sqrt{x} - 6x^{\frac{3}{2}}$

d. $\sin x + \tan x$ e. $e^{-x} - xe^{-x} + 2x^2e^{-x}$ f. $2x^4 + 5x^3 - 3x^2$

XII. Logarithms

25. Condense the expression $2\ln(x-3) + \ln(x+2) - 6\ln x$

26. Express y in terms of x.

a. $\ln y = x + 2$ b. $\ln y = 2\ln x + \ln 10$ \

c. $\ln y = 4\ln x + 3$ d. $x = \ln\dfrac{e^{x^2}}{4y}$

27. Solve for x.

a. $\ln e^3 = x$ b. $\ln e^x = 4$ c. $\ln x + \ln x = 0$ d. $e^{\ln 5} = x$

e. $\ln 1 - \ln e = x$ f. $\ln 6 + \ln x - \ln 2 = 3$ g. $\ln(x+5) = \ln(x-1) - \ln(x+1)$

XIII. Trigonometry

28. Evaluate (without a calculator!!). NO decimals.

a. $\cos 0$ b. $\sin 0$ c. $\tan \frac{\pi}{2}$ d. $\cos \frac{\pi}{4}$ e. $\sin \frac{\pi}{2}$ f. $\sin \pi$

g. $\sin^{-1} \frac{\sqrt{3}}{2}$ h. $\tan^{-1} 1$ i. $\cos^{-1} \frac{1}{2}$ j. $\sec^{-1} \sqrt{2}$

k. If $\cos\theta = \frac{5}{13}$ and θ is in Quadrant II, Find the all the remaining trig functions.

29. Which of the following expressions are identical?

a. $\cos^2 x$ b. $(\cos x)^2$ c. $\cos x^2$

30. Which of the following expressions are identical?

a. $(\sin x)^{-1}$ b. arcsinx c. $\sin x^{-1}$ d. $\frac{1}{\sin x}$

31. Solve the following for the indicated variable on the interval $[0, 2\pi)$.

a. $3\cos x - 1 = 2$ b. $2\sin(2x) - \sqrt{3} = 0$ c. $\tan^2 x - 1 = 0$ d. $2\sin^2 x + \sin x = 1$

32. Complete the following trig identities

a. $\sin^2 x + \cos^2 x =$ b. $\tan^2 x + 1 =$ c. $\frac{1 - (\sin x + \cos x)^2}{2\sin x}$

PART IV: Complete the following problems on this page. You should be able to do all these problems with and without a calculator. Using pencil, show all work. Failure to follow this format will result in no credit for this part.

Given $f(x) = x^2 - 2x + 5$, find the following.		
1. $f(-2) =$	2. $f(x+2) =$	3. $f(x+h) =$

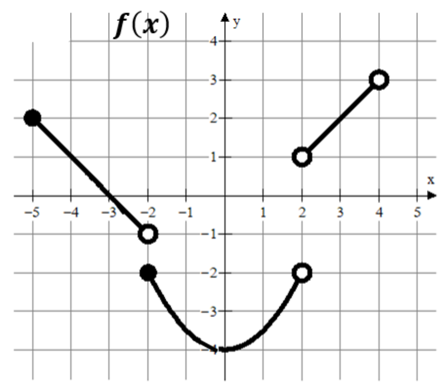
Use the graph $f(x)$ to answer the following.

4. $f(0) =$ $\quad$ $f(4) =$

$f(-1) =$ $\quad$ $f(-2) =$

$f(2) =$ $\quad$ $f(3) =$

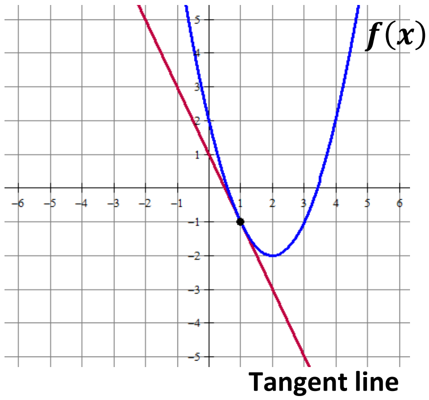
$f(x) = 2$ when x = ? $\quad$ $f(x) = -3$ when x = ?



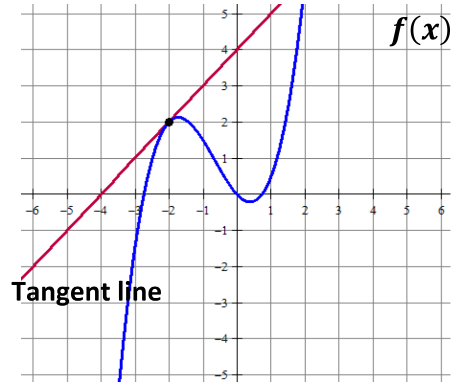
Write the equation of the line meets the following conditions. Use point-slope form. $y - y_1 = m(x - x_1)$		
5. slope $= 3$ and $(4, -2)$	6. $m = -\frac{3}{2}$ and $f(-5) = 7$	7. $f(4) = -8$ and $f(-3) = 12$

Write the equation of the tangent line in point slope form. $\boldsymbol{y - y_1 = m(x - x_1)}$

8. The line tangent to $f(x)$ at $x = 1$



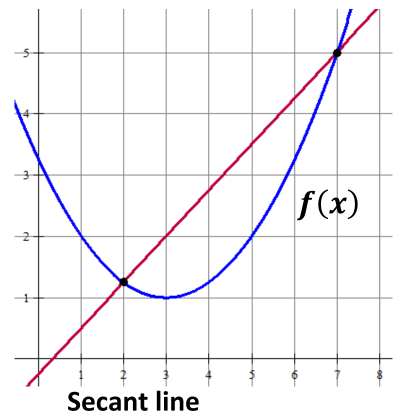
9. The line tangent to $f(x)$ at $x = -2$



MULTIPLE CHOICE! Remember slope = $\boldsymbol{\frac{y_2 - y_1}{x_2 - x_1}}$

10. Which choice represents the slope of the secant line shown?

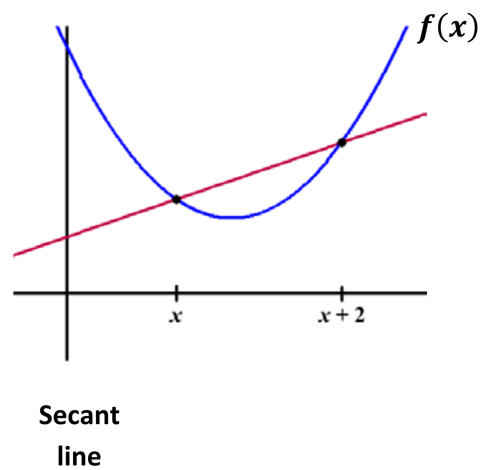
A) $\frac{7-2}{f(7)-f(2)}$ B) $\frac{f(7)-2}{7-f(2)}$ C) $\frac{7-f(2)}{f(7)-2}$ D) $\frac{f(7)-f(2)}{7-2}$



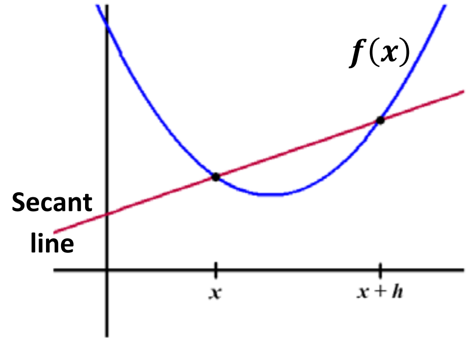
11. Which choice represents the slope of the secant line shown?

A) $\frac{f(x)-f(x+2)}{x+2-x}$ B) $\frac{f(x+2)-f(x)}{x+2-x}$ C) $\frac{f(x+2)-f(x)}{x-(x+2)}$

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



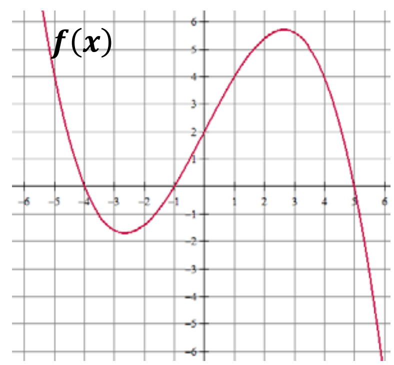
12. Which choice represents the slope of the secant line shown?



A) $\frac{f(x+h)-f(x)}{x-(x+h)}$ B) $\frac{x-(x+h)}{f(x+h)-f(x)}$ C) $\frac{f(x+h)-f(x)}{x+h-x}$

D) $\frac{f(x)-f(x+h)}{x+h-x}$

13. Which of the following statements about the function $f(x)$ is true?

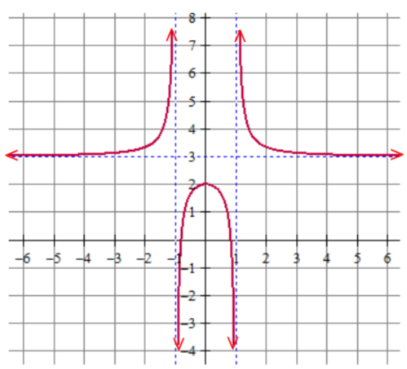


I. $f(2) = 0$
II. $(x + 4)$ is a factor of $f(x)$
III. $f(5) = f(-1)$

(A) I only
(B) II only
(C) III only
(D) I and III only
(E) II and III only

Find the domain and range (express in interval notation). Find all horizontal and vertical asymptotes.

14.



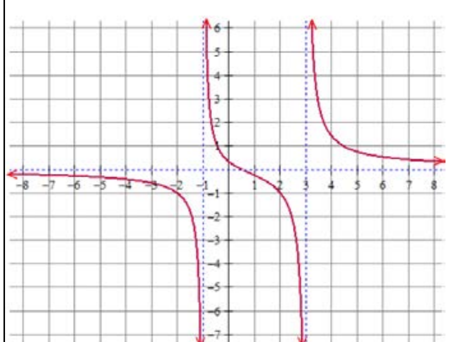
Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

15.



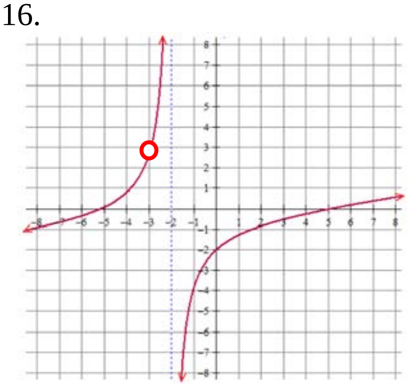
Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

16.



Domain:

Range:

Horizontal Asymptote(s):

Vertical Asymptotes(s):

MULTIPLE CHOICE!

17. Which of the following functions has a vertical asymptote at $x = 4$?

(A) $\frac{x+5}{x^2-4}$

(B) $\frac{x^2-16}{x-4}$

(C) $\frac{4x}{x+1}$

(D) $\frac{x+6}{x^2-7x+12}$

(E) None of the above

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18. Consider the function: $(x) = \frac{x^2-5x+6}{x^2-4}$. Which of the following statements is true?

I. $f(x)$ has a vertical asymptote of $x = 2$
II. $f(x)$ has a vertical asymptote of $x = -2$
III. $f(x)$ has a horizontal asymptote of $y = 1$

(A) I only

(B) II only

(C) I and III only

(D) II and III only

(E) I, II and III

Rewrite the following using rational exponents. Example: $\frac{1}{\sqrt[3]{x^2}} = x^{-\frac{2}{3}}$

19. $\sqrt[5]{x^3} + \sqrt[5]{2x}$	20. $\sqrt{x+1}$	21. $\frac{1}{\sqrt{x+1}}$
22. $\frac{1}{\sqrt{x}} - \frac{2}{x}$	23. $\frac{1}{4x^3} + \frac{1}{2}\sqrt[4]{x^3}$	24. $\frac{1}{4\sqrt{x}} - 2\sqrt{x+1}$

Write each expression in radical form and positive exponents. Example: $x^{-\frac{2}{3}} + x^{-2} = \frac{1}{\sqrt[3]{x^2}} + \frac{1}{x^2}$

25. $x^{-\frac{1}{2}} - x^{\frac{3}{2}}$	26. $\frac{1}{2}x^{-\frac{1}{2}} + x^{-1}$	27. $3x^{-\frac{1}{2}}$
28. $(x+4)^{-\frac{1}{2}}$	29. $x^{-2} + x^{\frac{1}{2}}$	30. $2x^{-2} + \frac{3}{2}x^{-1}$

Need to know basic trig functions in RADIANS! We never use degrees. You can either use the Unit Circle or Special Triangles to find the following.		
31. $\sin\frac{\pi}{6}$	32. $\cos\frac{\pi}{4}$	33. $\sin 2\pi$
34. $\tan\pi$	35. $\sec\frac{\pi}{2}$	36. $\cos\frac{\pi}{6}$
37. $\sin\frac{\pi}{3}$	38. $\sin\frac{3\pi}{2}$	39. $\tan\frac{\pi}{4}$
40. $\csc\frac{\pi}{2}$	41. $\sin\pi$	42. $\cos\frac{\pi}{3}$
43. Find x where $0 \le x \le 2\pi$, $\sin x = \dfrac{1}{2}$	44. Find x where $0 \le x \le 2\pi$, $\tan x = 0$	45. Find x where $0 \le x \le 2\pi$, $\cos x = -1$

Solve the following equations. Remember $e^0 = 1$ and $\ln 1 = 0$.		
46. $e^x + 1 = 2$	47. $3e^x + 5 = 8$	48. $e^{2x} = 1$
49. $\ln x = 0$	50. $3 - \ln x = 3$	51. $\ln(3x) = 0$
52. $x^2 - 3x = 0$	53. $e^x + xe^x = 0$	54. $e^{2x} - e^x = 0$

Solve the following trig equations where $0 \le x \le 2\pi$.

55. $\sin x = \frac{1}{2}$	56. $\cos x = -1$	57. $\cos x = \frac{\sqrt{3}}{2}$
58. $2\sin x = -1$	59. $\cos x = \frac{\sqrt{2}}{2}$	60. $\cos\left(\frac{x}{2}\right) = \frac{\sqrt{3}}{2}$
61. $\tan x = 0$	62. $\sin(2x) = 1$	63. $\sin\left(\frac{x}{4}\right) = \frac{\sqrt{3}}{2}$

For each function, determine its domain and range.

Function	**Domain**	**Range**
64. $y = \sqrt{x-4}$		
65. $y = (x-3)^2$		
66. $y = \ln x$		
67. $y = e^x$		
68. $y = \sqrt{4-x^2}$		

Simplify.

69. $\frac{\sqrt{x}}{x}$	70. $e^{\ln x}$	71. $e^{1+\ln x}$

72. $\ln 1$	73. $\ln e^7$	74. $\log_3 \frac{1}{3}$
75. $\log_{1/2} 8$	76. $\ln \frac{1}{2}$	77. $27^{\frac{2}{3}}$
78. $\left(5a^{2/3}\right)\left(4a^{3/2}\right)$	79. $\frac{4xy^{-2}}{12x^{-\frac{1}{3}}y^{-5}}$	80. $\left(4a^{5/3}\right)^{3/2}$

If $\boldsymbol{f(x) = \{(3,5),(2,4),(1,7)\}}$ $\boldsymbol{g(x) = \sqrt{x-3}}$ **,** **then determine each of the following.**
$\boldsymbol{h(x) = \{(3,2),(4,3),(1,6)\}}$ $\boldsymbol{k(x) = x^2 + 5}$

81. $(f+h)(1)$	82. $(k-g)(5)$	83. $f\big(h(3)\big)$
84. $g\big(k(7)\big)$	85. $h(3)$	86. $g\big(g(9)\big)$

87. $f^{-1}(4)$	88. $k^{-1}(x)$
89. $k\big(g(x)\big)$	90. $g(f(2))$