AP Calculus AB

SUMMER ASSIGNMENT - Part 1

Dear future Calculus AB student –

We are excited to work with you next year in Calculus AB☺. In order to help you be prepared for this class, please complete the summer assignment. We would like to recommend that you do this Short Answer Section first. In that packet there are directions and review of the main topics that you need for this packet as well as for the multiple choice packet. Do all work on these packets. **Show work to support your answers.** On the first day of class you will have a short amount of time to ask questions about the problems in this packet. Do not expect there to be time in class for ALL questions to be resolved. **You are responsible for understanding all of the material in this packet.**

If you have any questions, please do not hesitate to email either of us.

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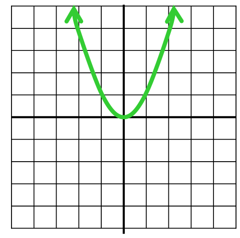
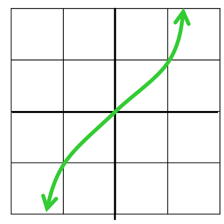
See you in August!
Mrs. Mishin and Mrs. Rigby

SHORT ANSWER SECTION

Objectives: For objectives #1 - #5 you should be able to do all without a calculator

1. Identify functions as even or odd
   - Algebraically
   - Graphically
2. Know key points and basic shapes of essential graphs
   - $f(x)=\sqrt{x},\ f(x)=x^2,\ f(x)=x^3$
   - $f(x)=e^x$
   - $f(x)=\ln(x)$
   - $f(x)=\sin x,\ f(x)=\cos x$
3. Review Trigonometry
   - Evaluate trig values
   - Evaluate inverse trig values
   - Solve trig equations
4. Understand characteristics of rational expressions (be able to sketch **without** a calculator)
   - Vertical asymptotes
   - Horizontal asymptotes
   - Zeros
   - Holes
5. Be able to use properties of natural logarithms to solve equations
6. Know your calculator

I. Symmetry – Even and Odd Functions

Quick Review		
Even Function	Symmetric about the y axis $f(-x) = f(x)$ for all x	Example: $y = x^2$ 
Odd Function	Symmetric about the origin (equivalent to a rotation of 180 degrees) $f(-x) = -f(x)$ for all x	Example: $y = x^3$ 

To determine algebraically if a function is even, odd, or neither, find $f(-x)$ and determine if it is equal to $f(x)$, $-f(x)$, or neither.

Example: Determine if $f(x) = \dfrac{4x}{x^2+1}$ is even or odd.

$f(-x) = \dfrac{4(-x)}{(-x)^2+1} = \dfrac{-4x}{x^2+1} = -\dfrac{4x}{x^2+1} = -f(x)$ Therefore, $f(x)$ is an odd function.

Determine if the following functions are even, odd, or neither.

1. $f(x) = \dfrac{x^2}{x^4+3}$

2. $f(x) = \dfrac{x}{x+1}$

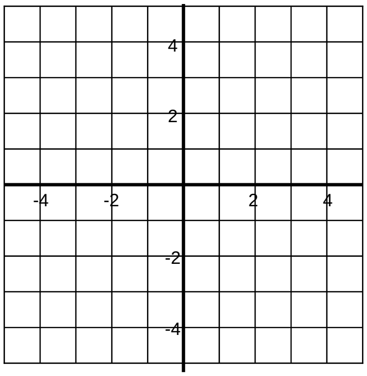
3. $f(x) = 1 + 3x^2 + 3x^4$

4. $f(x) = 1 + 3x^3 + 3x^5$

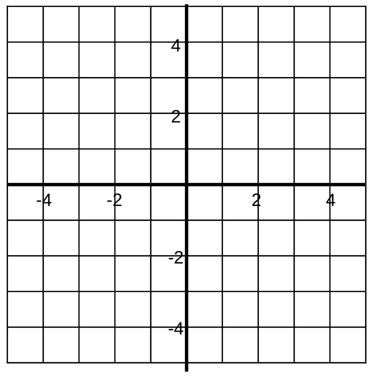
II. Essential Graphs

For each graph, show two key points (label coordinates) and basic shape of the graph.

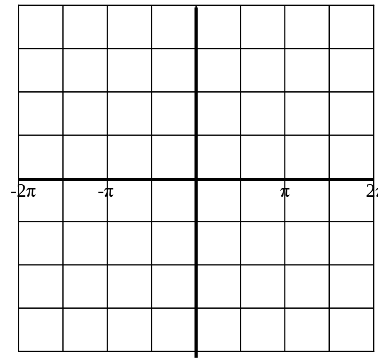
1. $f(x) = \sqrt{x}$



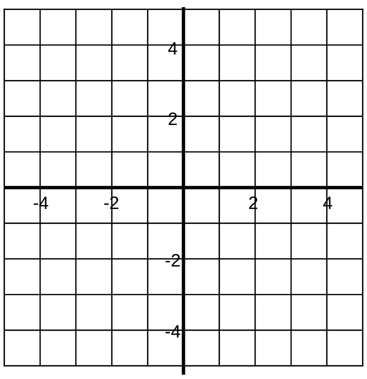
2. $f(x) = x^3$



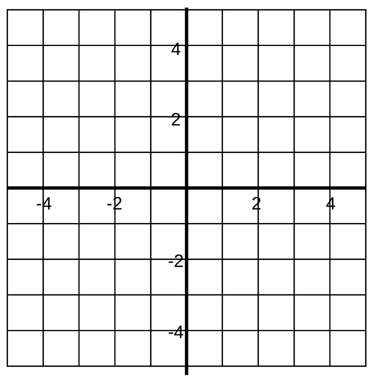
3. $f(x) = \sin x$



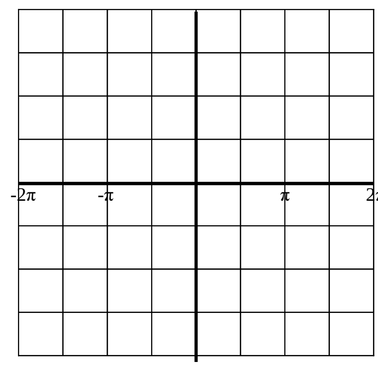
4. $f(x) = x^2$



5. $f(x) = \dfrac{1}{x}$

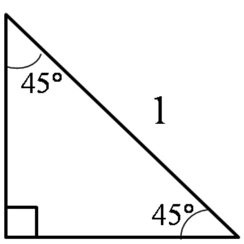


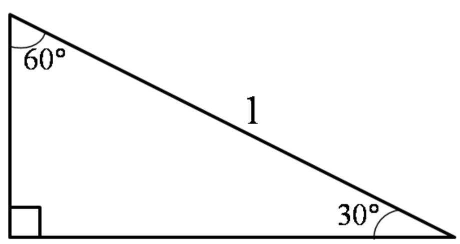
6. $f(x) = \cos x$



III. Trigonometry Review

On each right triangle with a hypotenuse of 1, label the lengths of the other sides:





45° = ______ radians 90° = ______ radians 30° = ______ radians 60° = ______ radians

⇨ In calculus we always use radians! Never degrees.

Make sure you know the following identities:

Pythagorean identities: $\sin^2 x + \cos^2 x = 1$ $\quad 1 + \tan^2 x = \sec^2 x$ $\quad \cot^2 x + 1 = \csc^2 x$

Double angle identities: $\sin 2x = 2\sin x \cos x$ $\quad \cos 2x = \cos^2 x - \sin^2 x$

1. Evaluate the sine, cosine, and tangent of each angle without using a calculator. It is not necessary (ever again!) to rationalize the denominator. (ie, an answer of $\frac{1}{\sqrt{2}}$ does not need to be written $\frac{\sqrt{2}}{2}$)

a) $\frac{\pi}{4}$ b) $\frac{5\pi}{4}$ c) $-\frac{\pi}{6}$

d) $\frac{\pi}{2}$ e) $\frac{5\pi}{3}$ f) $\frac{11\pi}{6}$

2. Find two solutions to the inverse trig equations. $\left(0 \le \theta \le 2\pi\right)$.
   1. Draw a triangle, if necessary
   2. Label θ and sides
   3. Determine reference angle
   4. Notice restrictions
   5. Place in correct quadrant

a) $\cos\theta = \frac{\sqrt{2}}{2}$ b) $\cos\theta = -\frac{\sqrt{2}}{2}$ c) $\sec\theta = 2$

d) $\tan\theta = 1$ e) $\cot\theta = -\sqrt{3}$ f) $\sin\theta = -\frac{\sqrt{3}}{2}$

3. Solve for y. Notice the only difference between question #2 and #3 is the domain restrictions #3. Inverse trig functions have one answer due to domain restrictions. Note: $\sin^{-1}x$ is the same as arcsinx

a) $y = \sin^{-1}\left(\frac{1}{2}\right)$ b) $y = \cos^{-1}\left(\frac{1}{2}\right)$ c) $y = \arctan\left(\sqrt{3}\right)$

d) $y = \csc^{-1}\left(2\right)$ e) $y = \arccos\left(0\right)$ f) $y = \cot^{-1}\left(-1\right)$

IV. Rational Functions

Rational functions are ratios of polynomials: $h(x)=\frac{f(x)}{g(x)}$

$h(x)$ has a **zero** when $h(x)=0$ (which occurs when $f(x)=0$ and the factor does not cancel)

Ex. $h(x)=\frac{x^2+x-2}{x^2-1}$ $\qquad h(x)=\frac{(x+2)(x-1)}{(x+1)(x-1)}$ $\qquad h(x)=\frac{(x+2)\cancel{(x-1)}}{(x+1)\cancel{(x-1)}}$

Therefore, $h(x)=0$ when $x=-2$.

$h(x)$ has a **vertical asymptote** when $g(x)=0$ and the factor that causes $g(x)=0$ does not cancel

Ex. $h(x)=\frac{x^2+x-2}{x^2-1}$ $\qquad h(x)=\frac{(x+2)(x-1)}{(x+1)(x-1)}$ $\qquad h(x)=\frac{(x+2)\cancel{(x-1)}}{(x+1)\cancel{(x-1)}}$

Therefore, $h(x)$ has a vertical asymptote when $x=-1$.

$h(x)$ has a **hole** (is undefined but the limit exists) when $g(x)=0$ and the factor that causes $g(x)=0$ cancels from both $f(x)$ and $g(x)$.

Ex. $h(x)=\frac{x^2+x-2}{x^2-1}$ $\qquad h(x)=\frac{(x+2)(x-1)}{(x+1)(x-1)}$ $\qquad h(x)=\frac{(x+2)\cancel{(x-1)}}{(x+1)\cancel{(x-1)}}$

Therefore, $h(x)$ has a hole when $x=1$.

Note that $h(x)\neq\frac{(x+2)}{(x+1)}$ because these two functions do not have the same domain.

$h(x)$ has a **horizontal asymptote** at $y=a$ when $\lim_{x\to\infty}h(x)=a$ or $\lim_{x\to-\infty}h(x)=a$. To determine $\lim_{x\to\infty}h(x)$ consider first the largest exponent of $f(x)$ and $g(x)$. If $f(x)$ has the larger exponent, then $\lim_{x\to\infty}h(x)=\infty$ (DNE). If $g(x)$ has the larger exponent, then $\lim_{x\to\infty}h(x)=0$. If the exponents are the same, consider the leading coefficient.

Ex. $h(x)=\frac{x^2+x-2}{x^2-1}$ $\qquad$ Leading coefficients $=\frac{1}{1}$

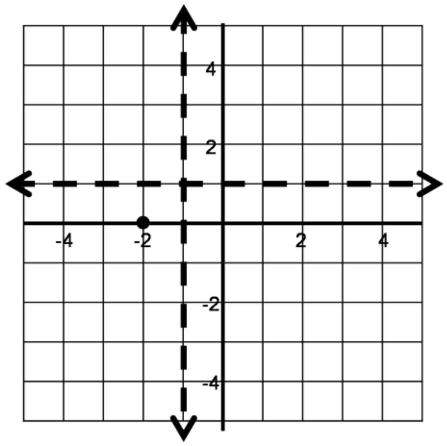
Therefore, $\lim_{x\to\infty}h(x)=1$ and $h(x)$ has a horizontal asymptote at $y=1$.

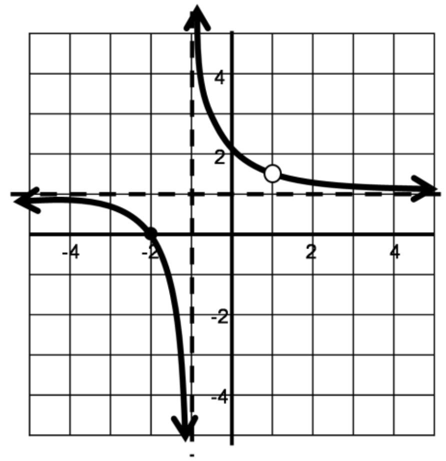
Once the basic characteristics of rational expressions are determined, the functions can be sketched without a calculator:

Ex. $h(x)=\dfrac{x^2+x-2}{x^2-1}$

Zero at $x=-2$.
Vertical Asymptote: $x=-1$
Hole when $x=1$
Horizontal Asymptote: $y=1$

Graph points as needed until you see the shape.

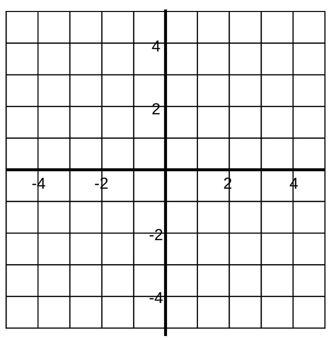




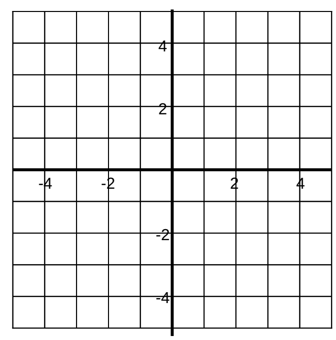
For each rational function below:

a) Find all zeros
b) Write the equations of all vertical asymptotes
c) Write the equations of all horizontal asymptotes
d) Find the x value of any holes
e) Sketch the graph (no calculator) showing all characteristics listed
(Not all functions will have all characteristics listed above)

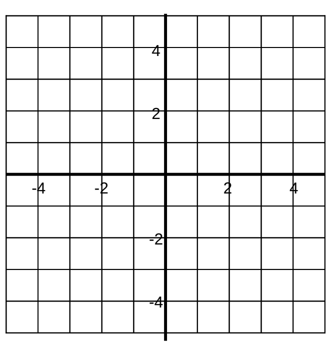
1. $f(x)=\dfrac{x+2}{x-1}$



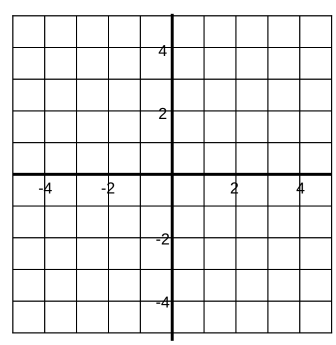
2. $f(x)=\dfrac{2x-3}{x+1}$



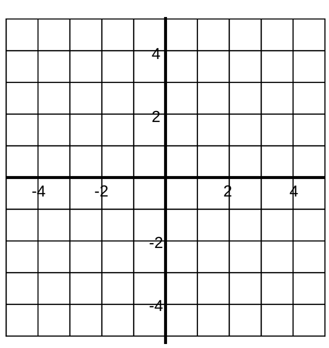
3. $f(x)=\dfrac{1}{x^2}$



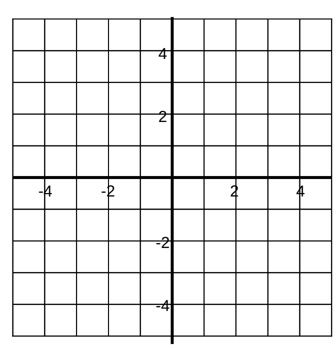
4. $f(x)=\dfrac{x-1}{x^2}$



5. $f(x)=\dfrac{x^2+3x-4}{x^2-x-6}$



6. $f(x)=\dfrac{x}{x^2-4}$



V. Properties of Natural Logarithms

Recall that $y=\ln(x)$ and $y=e^x$ (exponential function) are inverse to each other

Properties of the Natural Log:

$\ln(AB)=\ln(A)+\ln(B)$	Ex: $\ln(2)+\ln(5)=\ln(10)$
$\ln\left(\frac{A}{B}\right)=\ln(A)-\ln(B)$	Ex: $\ln(6)-\ln(2)=\ln\left(\frac{6}{2}\right)=\ln(3)$
$\ln(A^p)=p\ln(A)$	Ex: $\ln(x^4)=4\ln(x)$ and $3\ln(2)=\ln(2^3)=\ln(8)$

Know these without a calculator: $\ln(e^x)=x$, $\ln(e)=1$, $\ln(1)=0$, $e^0=1$

Use the properties of natural logs to solve for x.

Ex:

$5^x=7e^x$

$\frac{5^x}{7}=\ln e^x$

$\ln\left(\frac{5^x}{7}\right)=\ln e^x$

$\ln(5^x)-\ln(7)=x$

$x\ln(5)-\ln(7)=x$

$x\ln(5)-x=\ln(7)$

$x(\ln(5)-1)=\ln(7)$

$x=\frac{7}{\ln(5)-1}$

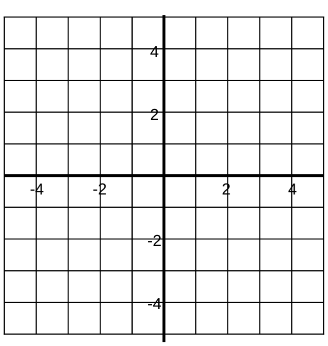
1. $10=4^x$

2. $2e^{3x}=4e^{5x}$

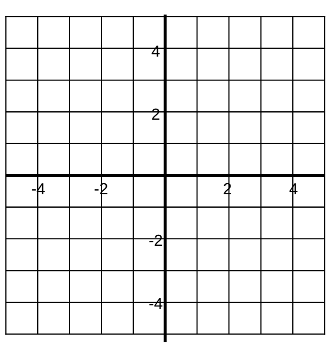
3. $10^{x+3}=5e^{7-x}$

Draw a sketch of each function. Make sure to label the key point and an asymptote.

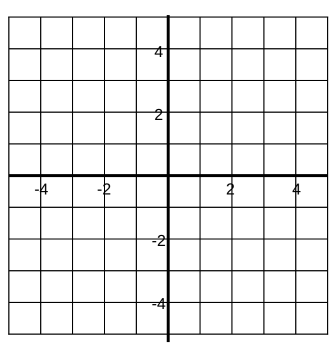
4. $y=2^x$



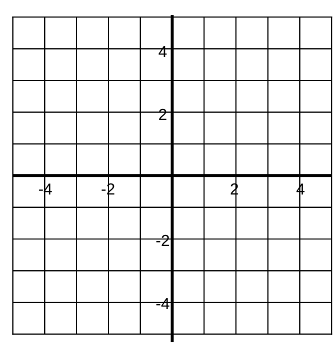
5. $y=e^x$



6. $y=-e^x$



7. $y=\ln x$



VI Calculator Skills

No matter what type of calculator you own, you should be able to do the following problems. Use the index of the owner's manual of your calculator to look up instructions or ask a classmate how to do each.

Evaluations:

1) Fractions and more. Be careful to use enough parentheses.

a) $\dfrac{6-.379}{3+\sqrt{2}}$ b) $\sqrt{2+\pi}$

2) Logarithms and Exponents

a) ln 2 b) log 2 c) ln (3e) d) 5^{-4} e) e^{3}

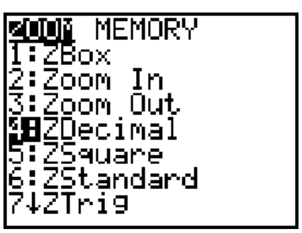
f) $\sqrt[3]{10}$ f) -18^{2} g) $(-18)^{2}$ h) $3^{(2)(.0134)}$

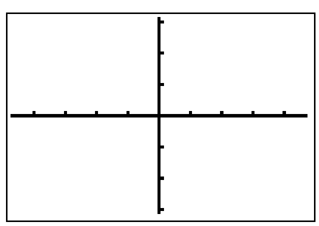
3) Trigonometry Evaluations. Make sure you watch the mode – degree versus radians.

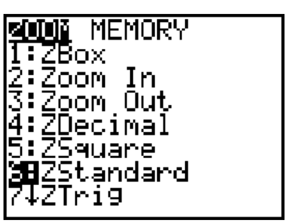
a) $\sin 23^{\circ}$ b) $\sin\dfrac{\pi}{5}$ c) $\sec\dfrac{\pi}{7}$ d) $\tan^{-1}(1.5)$ in radians & degrees

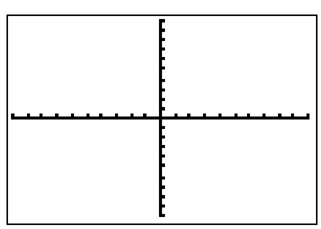
Graphing Skill #1: You should be able to graph a function in a viewing window that shows the important features. You should be familiar with the built-in zoom options for setting the window such as zoom-decimal and zoom-standard. You should also be able to set the window conditions to values you choose.

1. Graph $y = x^{2} - 3$ using the built in zoom-decimal and zoom-standard options. Draw each.

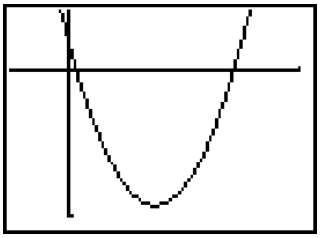








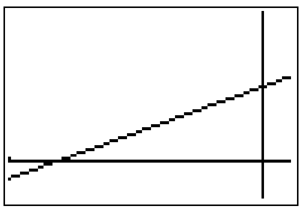
2. Find the appropriate viewing window to see the intercepts and the vertex defined by $y = x^2 - 11x + 10$. Use the window editor to enter the x and y values.



Window: Xmin = _______
Xmax = _______
Xscl = _______
Ymin = _______
Ymax = _______
Yscl = _______

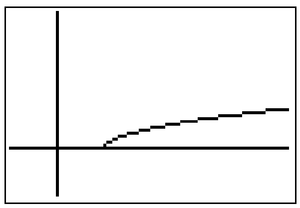
3. Find the appropriate viewing windows for the following functions:

$y = 10 + \frac{1}{4}x$



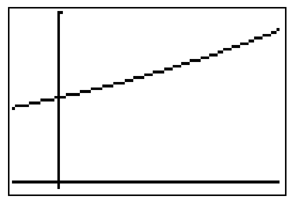
Xmin = _______
Xmax = _______
Xscl = _______
Ymin = _______
Ymax = _______
Yscl = _______

$y = \sqrt{x-5}$



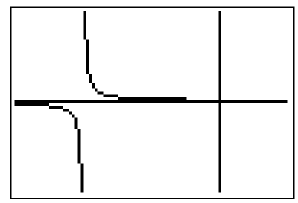
Xmin = _______
Xmax = _______
Xscl = _______
Ymin = _______
Ymax = _______
Yscl = _______

$y = 100(1.06)^x$



Xmin = _______
Xmax = _______
Xscl = _______
Ymin = _______
Ymax = _______
Yscl = _______

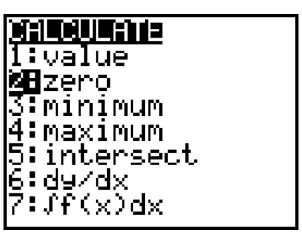
$y = \frac{1}{x+10}$

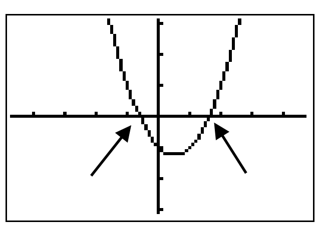


Xmin = _______
Xmax = _______
Xscl = _______
Ymin = _______
Ymax = _______
Yscl = _______

<u>Graphing Skill #2:</u> You should be able to graph a function in a viewing window that shows the x-intercepts (also called roots and zeros). You should be able to accurately estimate the x-intercepts to **3 decimal places.** Use the built-in root or zero command.

1**.** Find the x-intercepts of $y = x^2 - x - 1$. Window [-4.7, 4.7] x [-3.1, 3.1]





(Write intercepts as points)

x-intercepts: ______________

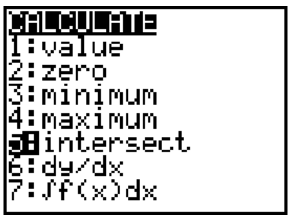
2. Find the x-intercepts of $y = x^3 - 2x - 1$.

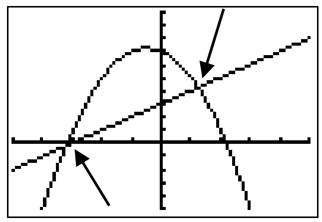
x-intercepts: ______________

Graphing Skill #3: You should be able to graph two functions in a viewing window that shows the intersection points. Sometimes it is impossible to see all points of intersection in the same viewing window. You should be able to accurately estimate the coordinates of the intersection points to **3 decimal places.** Use the built-in intersection command.

1. Find the coordinates of the intersection points for the functions:

$$f(x) = x + 3 \qquad g(x) = -x^2 - x + 7.$$





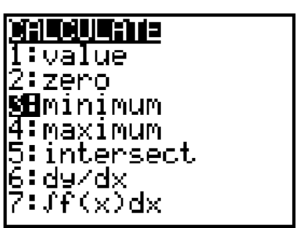
Intersection points: _______________

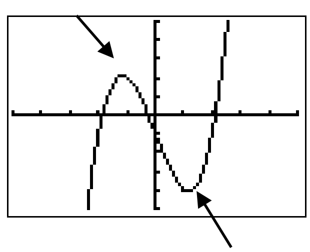
2. Find the coordinates of the intersection points of: $f(x) = 4x^2 \qquad g(x) = 2^x$.

Intersection points: _______________

Graphing Skill #4: You should be able to graph a function and estimate the local maximum or minimum values to **3 decimal places.** Use the built-in max/min command.

1. Find the maximum and minimum values of the function $y = x^3 - 4x - 1$.





(Value means the y-value)

Minimum value: _______________

Maximum value: _______________

2. Find the maximum and minimum values of the function $y = x^3 - 4x^2 + 4x$.

<u>REVIEW:</u> Do the following problems on your calculator.

1. $\dfrac{\sqrt{-4 + 8.556}}{2 + \sqrt[3]{9}}$

2. $\ln 4e^{\sqrt{12}} - 1.32$

3. $\sin 48°$

4) $\cos^{-1}(-.75)$ in radians and degrees

5) $\tan \dfrac{5\pi}{6}$

6) Find the x-intercepts, relative maximum, and relative minimum of $y = x^3 + 2x^2 - 1$

7) Find the coordinates of the intersection points for the functions $f(x) = 2x^2 + x - 9$ and $g(x) = -\dfrac{3}{4}x + 3$

AP Calculus AB

SUMMER ASSIGNMENT – Part 2

Multiple Choice Section

Directions: Please read questions carefully. It is recommended that you do the Short Answer Section prior to doing the Multiple Choice.

Show all work on this packet. If no work is required, EXPLAIN how you arrived at your answer. Follow calculator instructions as given in each section.

* A choice of "none" is short for "none of these". A choice of DNE means "does not exist".

These problems are due the first day of class. On the first day of class you will have a short amount of time to ask questions before turning these packets in. Do not expect there to be time in class for ALL questions to be resolved. **You are responsible for understanding all of the material in this packet.**

NO CALCULATOR

Lines and functions

1) Determine the slope of the line that passes through the points (-1, 6) and (11, -6).

a) 1 b) -1 c) 0 d) $\frac{6}{5}$

2) Find the equation of the line that passes through the point (1, -1) and has a slope of -3.

a) y = -3x – 2 b) y = -3x + 2 c) y = -3x – 1

d) y = -3x + 4 e) none of these

3) Determine which points lie on the vertical line that contains the point (5, 1).

a) (5, 0) b) (0, 1) c) (1, 5)

d) all of these e) none of these

4) What is the slope of the line parallel to the line 7x - 2y = 12?

a) $\frac{7}{2}$ b) $\frac{-7}{2}$ c) $\frac{2}{7}$ d) -6

5) Find an equation of the line that passes through (-1, -3) parallel to the line 2x + y = 19.

a) y = -2x – 3 b) y = -2x – 5 c) y = 2x – 1

d) $y = -\frac{1}{2}x - \frac{7}{2}$ e) none of these

6) Find an equation of the line that passes through (8, 17) and is perpendicular to the line x + 2y = 2.

7) Given A = {1, 2, 3} and B = {-2, -1, 0, 1}, determine which of the sets of ordered pairs represents a function from A to B.

a) {(1, -2), (2, -2), (3, -1), (2, 0), (2, 1)}
b) {(1, -2), (2, -1), (2, 0), (3, 1)}
c) {(1, -2), (2, -1), (3, 0), (1, 1)}
d) all of these
e) none of these

8) Which of the following **does not** represent y as a function of x?

a) $3x^2 + 4y = 8$
b) $3x - 2y = 0$
c) $3x^3 + y = 0$
d) $3x + 4y^2 = 8$
e) $x^2 - y = 16$

9) Given $f(x) = 6 - 2x^2$, find $f(-3)$.

a) 12
b) 24
c) -12
d) -24
e) none

10) Given $f(x) = \begin{cases} x^2 + 1, & x < 4 \\ 6x - 7, & x \geq 4 \end{cases}$ find $f(-2)$.

a) -19
b) 5
c) 4
d) -5
e) none

11) Given $f(x) = 6$ and $g(x) = 2x^2 - 1$, find $f(x) - g(x)$.

a) $2x^2 + 5$
b) $2x^2 - 7$
c) $-2x^2 + 7$
d) $-2x^2 + 5$
e) none

12) Given $f(x) = x^2$ and $g(x) = x + 5$, find $g(f(x))$.

a) $(x + 5)^2$
b) $x^2 + 5$
c) $x^2 + 25$
d) $x^2 + 5x^2$
e) none

13) Given $f(x) = x$ and $g(x) = x^2 - 7$, find $f(3) \bullet g(3)$.

a) -13
b) 29
c) 5
d) 6
e) none

14) Given $f(x) = x^2 - 2x$ and $g(x) = 2x + 3$, find $f(g(x))$.

a) $4x^2 + 8x + 3$ b) $2x^2 - 4x + 3$ c) $2x^3 - x^2 - 6x$

d) $3x^2 + x$ e) none of these

15) Given $f(x) = x^2$ and $g(x) = \sqrt{x - 6}$, find $f(g(-1))$.

16) If $f(x) = \frac{1}{2}x$, find $\frac{f(x+h) - f(x)}{h}$.

a) 2 b) $\frac{1}{2}$ c) $\frac{x + \frac{1}{2}h}{h}$ d) 1 e) none

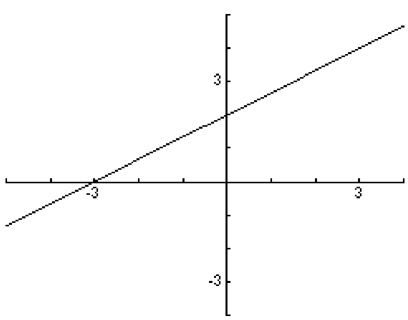
17) Is the function $f(x) = 2x^3 + 3x^2$ even, odd, or neither? Show why.

18) If f is a one-to-one function on its domain, the graph $f^{-1}(x)$ is a reflection of the graph of $f(x)$ with respect to:

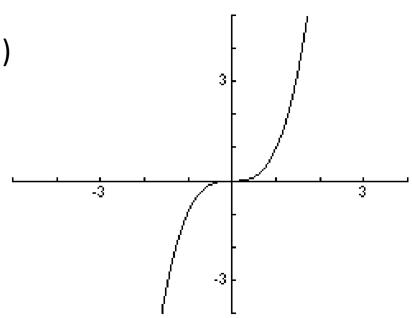
a) the x-axis b) the y-axis c) y = x d) y = -x e) none

19) In which graph does y not represent a one-to-one function of x?

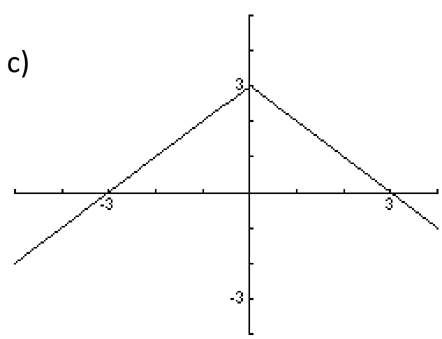
a)



b)



c)



d) All of these are one-to-one functions of x. e) None of these are one-to-one function of x.

20) Given $f(x) = 3x^3 - 1$, find $f^{-1}(x)$.

a) $\frac{1}{3x^3 - 1}$ b) $3x^{-1} - 1$ c) $3(x+1)$ d) $\sqrt[3]{\frac{x+1}{3}}$ e) none

CALCULATOR

Lines and functions

21) Use your calculator to determine the interval(s) on the real axis for which $f(x) \geq 0$ where $f(x) = \sqrt{x-9}$.

a) $(-\infty, \infty)$ b) $[-9, 9]$ c) $[-3, 3]$ d) $[9, \infty)$ e) none

22) Find the relative max/min of $f(x) = x^3 - x$.

a) relative maximum at (-0.58, -0.38)

b) relative maximum at (-0.58, 0.38)
relative minimum at (0.58, -0.38)

c) relative maximum at (0.58, -0.38)
relative minimum at (-0.58, 0.38)

d) no relative minimum or relative maximum

e) none of these

23) Find the minimum point on the graph of $f(x) = x^2 - 4x + 14$.

a) (2, 18) b) (-2, 18) c) (-2, 26) d) (2, 10) e) none

NO CALCULATOR

Solving equations

24) Solve for x. $\frac{3x}{2} - \frac{x+1}{4} = 6$

a) 5 b) $\frac{23}{5}$ c) $\frac{35}{8}$ d) $\frac{1}{2}$ e) none

25) Solve for x. $\frac{1}{x-3} - \frac{2}{x+3} = \frac{2x}{x^2-9}$

a) $-\frac{1}{2}$ b) 3 c) -3 d) -3 and 3 e) none

26) Solve for x. $\frac{7x}{x-2} + \frac{2x}{x+2} = 9$

a) $-\frac{18}{5}$ b) $\frac{2}{3}$ c) $-\frac{2}{5}$ d) $\frac{5}{18}$ e) none

27) Solve for p: $g = \frac{4\pi^2 p}{r^2}$.

28) Solve for x. $(x+2)^2 = -16x$

a) $-8 \pm 2\sqrt{15}$ b) $-10 \pm 4\sqrt{6}$ c) $-10 \pm 2\sqrt{26}$ d) $-8 \pm 4\sqrt{15}$ e) none

29) Solve for x. $(3x-1)^2 = 25$

a) $-\frac{4}{3}$, 2 b) -2, 2 c) 2 d) -2, $\frac{4}{3}$ e) none

30) Solve for x. $3x^3 - 24x^2 + 21x = 0$

a) 7, 1 b) -7, -1 c) 0, 1, 7 d) 0, -1, -7 e) none

31) Solve for x. $(x^2+4)^{\frac{2}{3}} = 25$

a) -5.8, 5.8 b) -4.6, 4.6 c) 21 d) -11, 11 e) none

32) Solve for x. $|2-4x| = 12$

a) $-\frac{5}{2}, \frac{7}{2}$ b) $-\frac{5}{2}, -\frac{7}{2}$ c) $\frac{5}{2}, -\frac{5}{2}$ d) $-\frac{5}{2}$ e) none

33) Solve by factoring. $2x^2 + 4x = 9x + 18$

a) $-2, \frac{9}{2}$ b) $2, -\frac{9}{2}$ c) $\frac{9}{2}$ d) $-\frac{9}{2}$ e) none

34) Solve by completing the square. $x^2 - 6x + 1 = 0$

a) $3 \pm \sqrt{26}$ b) $3 \pm \sqrt{10}$ c) $3 \pm \sqrt{17}$ d) $3 \pm 2\sqrt{2}$ e) none

35) Solve for x. $\frac{2x-1}{x} + 1 = \frac{4}{x+1}$

a) 1 b) -1 c) $-\frac{1}{3}, 1$ d) $-1, \frac{1}{3}$ e) none

36) Solve for x. $3x^2 - 6x + 2 = 0$

a) $\frac{3 \pm \sqrt{3}}{3}$ b) $1 \pm \sqrt{3}$ c) $\frac{3 \pm \sqrt{15}}{3}$ d) $\frac{1}{3}, 2$ e) none

37) Solve for x. $4x^2 + 12x = 135$

a) $-\frac{9}{2}, \frac{15}{2}$ b) $-\frac{5}{2}, \frac{3}{2}$ c) $-\frac{15}{2}, \frac{9}{2}$ d) $-\frac{3 \pm \sqrt{6}}{2}$ e) none

38) Solve the inequality algebraically. $3 - 2x \le 9$

a) $(-\infty, -3]$ b) $(-\infty, 3]$ c) $[-3, \infty)$ d) $[3, \infty)$ e) none

39) Find all the real zeros of the polynomial function $f(x) = x^6 - x^2$.

a) 0 b) 0, 1 c) 1 d) 0, 1, -1 e) none

CALCULATOR

Solving equations

40) Approximate the solution(s) of $x^4 + 2x^3 + 5x - 1 = 0$ using your graphing calculator.

a) -2.72, 0.20 b) -1, 0 c) -2.72, -0.11 d) no solution e) none

41) Use your graphing calculator to approximate the solution(s) of $\dfrac{1}{x-3} = 9$.

a) 3.000 b) 3.11 c) 2.90 d) no solution

42) Approximate the points of intersection of the graphs of $y = 5x - 14$ and $y = -3x - 6$.

a) (1, -9) b) (2, -4) c) (3, -15) d) no solution e) none

43) Approximate the solution(s) of $|3x + 10| = 13$.

a) 1 b) -1, 1 c) -7.67, 1 d) 1, 7.67 e) none

44) Evaluate $y = \dfrac{300}{1 + e^{-2t}}$ when $t = 3$.

a) 299.2582 b) 213.3704 c) 300.0025 d) 107.4591 e) none

NO CALCULATOR

Factoring and division

45) Use synthetic division to factor the polynomial $x^3 - x^2 - 10x - 8$ completely if -2 is a zero.

a) $(x-2)(x-4)(x+1)$ b) -2, -4, -1 c) $(x+2)(x-4)(x+1)$

d) $(x+2)(x+4)(x-1)$ e) none of these

46) Which polynomial function has zeros of 0, -1 and 2?

a) $f(x) = x(x-1)(x+2)$ b) $f(x) = x(x+1)(x-2)$

c) $f(x) = (x+1)(x-2)$ d) $f(x) = (x+1)^2(x-2)$ e) none

47) Use long division to find the quotient. $(6x^3 + 7x^2 - 15x + 6) \div (2x - 1)$

a) $3x^2 + 2x - \frac{17}{2} - \frac{5}{2(2x-1)}$ b) $3x^2 + 5x - 5 + \frac{1}{(2x-1)}$

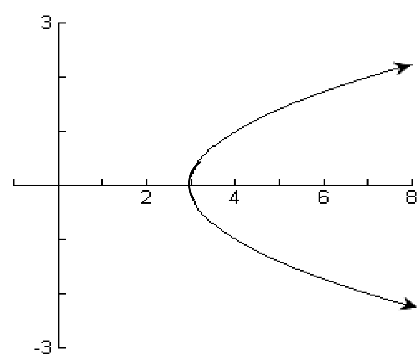
c) $3x^2 + 5x + 5 + \frac{11}{(2x-1)}$ d) $3x^2 + 4x - 17 + \frac{29/2}{(2x-1)}$

48) Use synthetic division to find the quotient. $(3x^4 + 4x^3 - 2x^2 + 6x + 1) \div (x + 2)$

NO CALCULATOR

Graphs

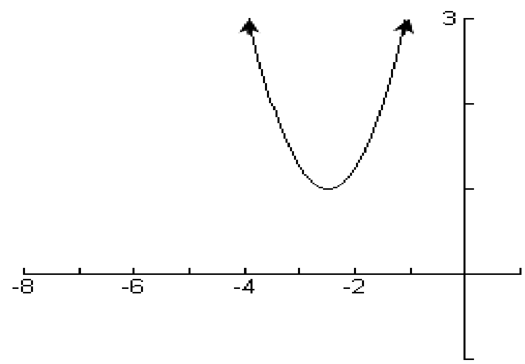
49) Find the domain of the relation shown at the right.



a) $(-\infty, \infty)$ b) $(-\infty, 3]$ c) $(-\infty, 3)$

d) $[3, \infty)$ e) none of these

50) Find the range of the function shown at the right.



a) $(-\infty, \infty)$ b) $(-8, 1)$ c) $[-3, \infty)$

d) $[-1, 5]$ e) none of these

51) Find the domain of the function $f(x) = \sqrt{5 - x}$.

a) $(-\infty, 5]$ b) $(-\infty, 5)$ c) $[-5, \infty)$ d) $(-5, \infty)$ e)none

52) Describe the transformation of the graph of $f(x) = |x|$ which yields the graph of $g(x) = |x| - 20$.

a) vertical shift 20 units up

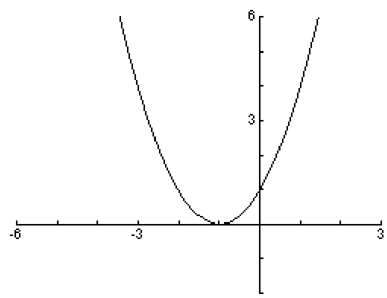
b) vertical shift 20 units down

c) horizontal shift 20 units right

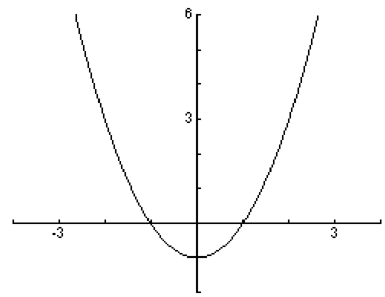
d) horizontal shift 20 units left

53) Graph $g(x) = (x - 1)^2$ using a transformation of the graph of $f(x) = x^2$.

a)



b)



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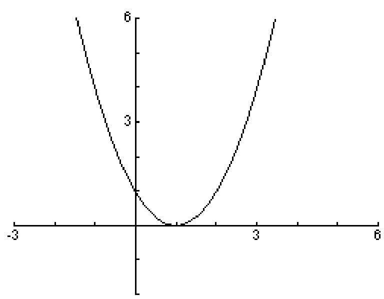
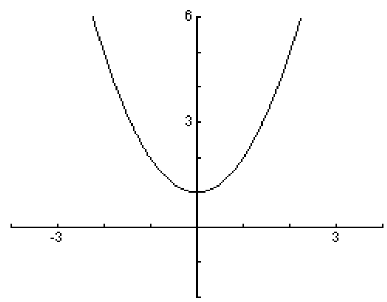


d)



54) Which sequence of transformations will yield the graph of $g(x) = (x + 1)^2 + 10$ from the graph of $f(x) = x^2$?

a) horizontal shift 10 units right
vertical shift 1 unit up

b) horizontal shift 1 unit left
vertical shift 10 units up

c) horizontal shift 1 unit right
vertical shirt 10 units up

d) horizontal shift 10 units left
vertical shift 1 unit up

55) Find the x-intercept(s) of $3x^2 + 2y^2 + 4xy - 12 = 0$

a) $(\pm\sqrt{6}, 0)$ b) $(\pm 2, 0)$ c) (4, 0) d) (6, 0) e) none

56) Find the intercepts of the graph of $3x + 7y = 21$.

a) x-int: (0, 7)
y-int: (3, 0)

b) x-int: (0, 3)
y-int: (7, 0)

c) x-int: (3, 0)
y-int: (0, 7)

d) x-int: (7, 0)
y-int: (0, 3)

e) none

57) Find the x and y-intercepts: $y = x^2 - 5x + 4$

a) (0, -4), (0, 1), (4, 0)

b) (0, 4), (4, 0), (1, 0)

c) (0, -4), (-4, 0), (-1, 0)

d) (0, 4), (-4, 0), (-1, 0)

e) none of these

58) Determine the left and right behaviors of the graph of $f(x) = -x^5 + 2x^2 - 1$.

a) up to the left, down to the right

b) down to the left, up to the right

c) up to the left, up to the right

d) down to the left, down to the right

e) none of these

59) Determine the left and right behaviors of the graph of $f(x) = -x^4 + 3x^3 + 5x^2$.

a) up to the left, down to the right

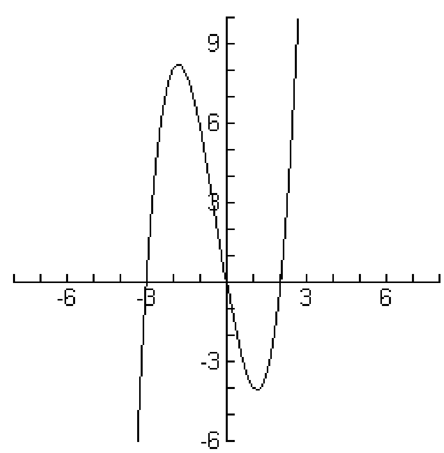
b) down to the left, up to the right

c) up to the left, up to the right

d) down to the left, down to the right

e) none of these

60) Which function is graphed?



a) $f(x) = x^3 + x^2 - 6$

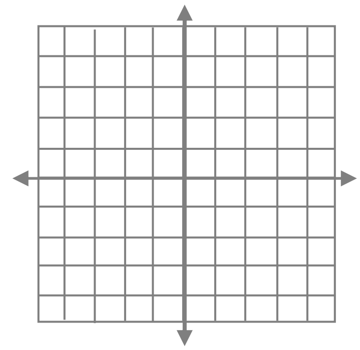
b) $f(x) = -x^3 - x^2 + 6x$

c) $f(x) = x^3 + x^2 - 6x$

d) $f(x) = x^4 + x^2 - 6x$

e) none of these

61) Graph the following: $f(x) = \begin{cases} -x^2 + 2, & x \le 0 \\ x + 2, & x > 0 \end{cases}$



62) Find the domain of the function $f(x) = \dfrac{1}{x^2 - 3x + 2}$.

a) $(-\infty, -2), (-2, 1), (1, \infty)$ b) $(-\infty, 1), (1, 2), (2, \infty)$ c) $(-\infty, \infty)$

d) $(-\infty, \frac{1}{2}), (\frac{1}{2}, \infty)$ e) none of these

63) Find the domain of $f(x) = \dfrac{x + 2}{x^2 - 3x + 2}$.

a) all real numbers except -2, 1, and 2 b) all real numbers except -2

c) all real numbers except 1 and 2 d) all real numbers e) none

64) Find the domain of $f(x) = \dfrac{3x - 1}{x^2 + 9}$.

a) all real numbers b) all real numbers except ± 3

c) all real numbers except $\dfrac{1}{3}$ d) all real numbers except $\dfrac{1}{3}, \pm 3$

65) Find the vertical asymptote(s) of the graph of $f(x) = \dfrac{x + 3}{(x - 2)(x + 5)}$.

a) y = 2, y = -5, y = -3 b) x = 2, x = -5, x = -3, x = 1

c) x = 1 d) x = 2, x = -5 e) none

66) Find the horizontal asymptote(s) of the graph of $f(x) = \dfrac{3x - 1}{x + 2}$.

a) y = 0 b) x = -2 c) $x = \dfrac{1}{3}$ d) y = 3 e) none

67) Find the horizontal asymptote(s) of the graph of $f(x) = \dfrac{3x^2 + 2x - 16}{x^2 - 7}$

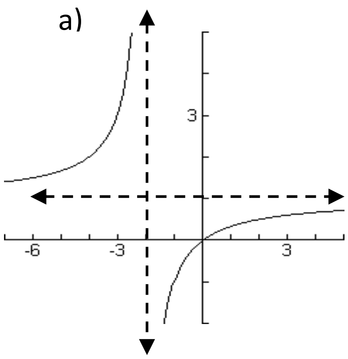
a) $x = \pm\sqrt{7}$ b) y = 3 c) $y = \pm 7$ d) y = 0 e) none

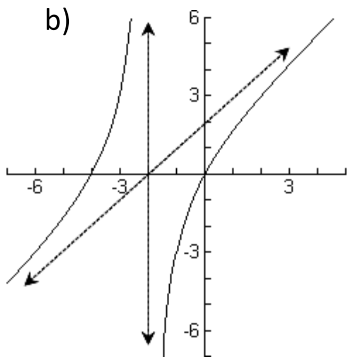
68) Find all intercepts of the graph of $f(x) = \dfrac{x - 14}{2x + 7}$.

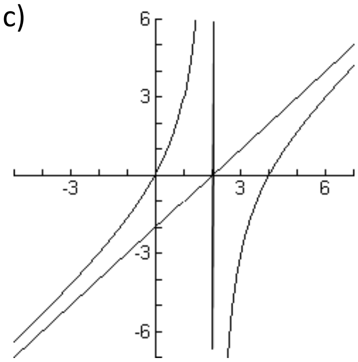
a) (0, -2), (14, 0) b) (-14, 0), $(\frac{1}{2}, 0)$ c) (14, 0), $(0, \frac{1}{2})$

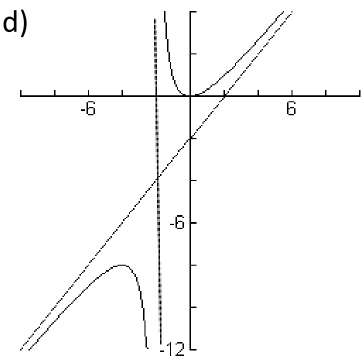
d) (14, 0), $(0, -\frac{7}{2})$ e) none

69) Match the rational function with the correct graph. $f(x) = \dfrac{x^2}{x + 2}$

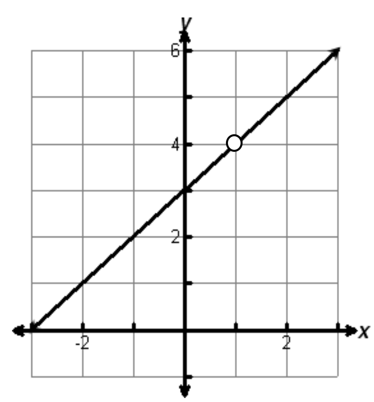
a)


b)


c)


d)


70) Match the graph with the correct function.



a) $f(x) = \dfrac{x + 3}{x - 1}$ b) $f(x) = x + 3$

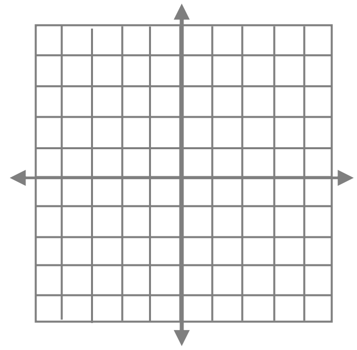
c) $f(x) = \dfrac{x - 1}{x^2 + 2x - 3}$ d) $f(x) = \dfrac{x^2 + 2x - 3}{x - 1}$

e) None of these

71) What is the domain of $f(x) = 3 - e^x$?

a) $(3, \infty)$ b) $[0, \infty)$ c) $(-\infty, \infty)$ d) $(-\infty, 3)$ e) none

72) Without using a graphing utility, sketch the graph of $f(x) = 3^x - 2$.



NO CALCULATOR

Trigonometry

73) Give the exact value of $\cos\left(-\frac{3\pi}{4}\right)$.

a) $-\frac{\sqrt{2}}{2}$ b) $-\frac{1}{2}$ c) $\frac{\sqrt{3}}{2}$ d) $\frac{\sqrt{2}}{2}$ e) none

74) Find all solutions to $2\cos x - \sqrt{3} = 0$ in the interval $[0, 2\pi]$.

a) $\frac{\pi}{6}, \frac{11\pi}{6}$ b) $\frac{5\pi}{6}, \frac{7\pi}{6}$ c) $\frac{\pi}{3}, \frac{5\pi}{3}$ d) $\frac{2\pi}{3}, \frac{4\pi}{3}$

75) Give the exact value of $\csc\frac{3\pi}{2}$.

a) 2 b) undefined c) -1 d) 1 e) none of these

76) Find all solutions to $\sec^2 x = \sec x + 2$ in the interval $[0, 2\pi]$.

a) $\frac{\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{3\pi}{2}$ b) $\frac{\pi}{3}, \pi, \frac{5\pi}{3}$ c) $\frac{2\pi}{3}, \frac{4\pi}{3}$ d) $\frac{\pi}{6}, \pi, \frac{11\pi}{6}$

77) Find the exact value of $\tan\frac{5\pi}{6}$.

a) $\frac{\sqrt{3}}{2}$ b) $\sqrt{3}$ c) -1 d) $-\frac{\sqrt{3}}{3}$

78) Evaluate $\sec\frac{\pi}{3}$.

a) $\frac{\sqrt{2}}{2}$ b) $\frac{\sqrt{3}}{2}$ c) $\frac{\sqrt{3}}{3}$ d) 2

79) Find all solutions of $2\sin x\cos x + \cos x = 0$ in the interval $[0,\ 2\pi)$.

a) $\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{3\pi}{2}$ b) $\frac{\pi}{2}, \frac{7\pi}{6}, \frac{3\pi}{2}, \frac{11\pi}{6}$ c) $\frac{5\pi}{6}, \frac{11\pi}{6}$

d) $0,\ \pi$ e) none of these

CALCULATOR

Trigonometry

80) Given $\tan\theta = 1.2617$, find θ.

a) 0.0220 b) 0.9006 c) 1.0145 d) 0.3193 e) none

81) Find two values of θ ($0 \le \theta \le 2\pi$) that satisfy $\sec\theta = 5.1258$.

a) 1.767 and 4.516 b) 1.374 and 4.909 c) 1.134 and 1.767

d) 1.767 and 4.909 e) none of these

82) Evaluate $arc\cos(-0.4777)$.

a) -1.0049 b) 1.0728 c) 2.0934 d) 2.0688 e) none

NO CALCULATOR

Logarithms and natural logarithms

83) Solve for x. $27^{x} = 81$

a) $\frac{3}{4}$ b) $-\frac{1}{3}$ c) $\frac{4}{3}$ d) $\frac{2}{3}$ e) none

84) Evaluate. $\ln e^{1-x}$

a) e^{1-x} b) e c) $1-x$ d) $\ln(1-x)$ e) none

85) Simplify. $\ln \sqrt[5]{e^{3}x}$

a) $\frac{3e}{5} + \frac{1}{5}\ln x$ b) $\frac{3e}{5} + \ln\frac{x}{5}$ c) $\frac{3}{5} + \ln\frac{x}{5}$ d) $\frac{3}{5} + \frac{1}{5}\ln x$ e) none

86) Simplify. $\ln\sqrt{e^{3}}$

a) $\ln\frac{3}{2}$ b) $\ln\frac{2}{3}$ c) $\frac{3}{2}$ d) $\frac{2}{3}$ e) none

87) Solve for x. $\ln e^{2x+1} = 9$

a) $\frac{-1+\ln 9}{2}$ b) $\frac{9}{2\ln e} - \frac{1}{2}$ c) 23 d) 4 e) none

88) Simplify. $7 + \ln e^{5x}$

a) $5x + \ln 7$ b) $7 + 5x$ c) $\frac{\ln 7}{5x}$ d) 35x e) none

89) Solve for x. $2^{1-x} = 3^x$

a) $\frac{\ln 2}{\ln 6}$ b) $\ln\frac{1}{3}$ c) $\ln\frac{2}{3}$ d) $\ln 3 + \ln 2$ e) none

90) Solve for x. $\ln(7 - x) + \ln(3x + 5) = \ln(24x)$

a) $\frac{6}{11}$ b) $\frac{7}{3}$ c) $\frac{7}{3}, -5$ d) $\frac{6}{11}, 5$ e) none

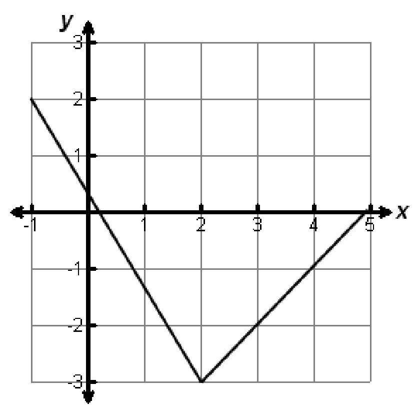
91) Find the domain of the function $f(x) = \ln(x-1)$.

a) $(-\infty, \infty)$ b) $(0, \infty)$ c) $(1, \infty)$ d) $(-\infty, 1)$ e) none

NO CALCULATOR

Limits

92) Use the graph to estimate $\lim_{x\to 2} f(x)$.

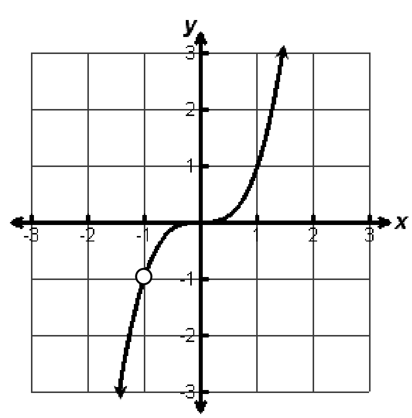


a) DNE b) 0

c) -3 d) 2

e) none

93) Use the graph to find $\lim_{x\to -1} f(x)$, if it exists.



a) 1 b) -2

c) DNE d) -1

e) -3

94) Find $\lim_{x \to -3} (-2x^2 + 1)$

a) 37   b) 19   c) -17   d) $\pm\sqrt{2}$ e) none

95) Find $\lim_{x \to 1} \dfrac{3x^3 - 4x^2 - 5x + 2}{x^2 - x - 2}$.

96) Find $\lim_{x \to 1} f(x)$ if $f(x) = \begin{cases} x^2 + 4, & x \neq 1 \\ 2, & x = 1 \end{cases}$

97) If $\lim_{x \to c} f(x) = -\dfrac{1}{2}$ and $\lim_{x \to c} g(x) = \dfrac{2}{3}$, find $\lim_{x \to c} \left[f(x) - g(x) \right]$.

98) Find $\lim_{x \to -1} \dfrac{x^2 - 5x - 6}{x + 1}$.

a) 0   b) -7   c) $-\infty$ d) ∞ e) none

99) Find $\lim_{x \to -2} \dfrac{x + 2}{x^3 + 8}$.

a) $\dfrac{1}{20}$ b) 0   c) $-\dfrac{1}{4}$ d) $\dfrac{1}{12}$ e) DNE

100) Find the limit. $\lim_{\Delta x \to 0} \dfrac{(x + \Delta x)^2 - 2(x + \Delta x) - (x^2 - 2x)}{\Delta x}$

a) $-4x$ b) -2   c) $2x - 2$ d) DNE   e) none