For Parts A-E and G, refer to the notes and answers on the school website if you get stuck.

A. Piecewise Functions: (Do not use a calculator.) Name_____

Graph the following piecewise functions:

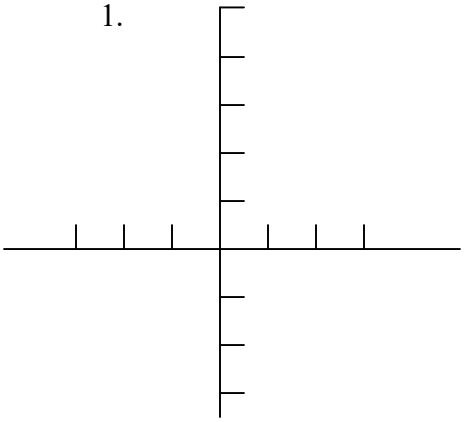
1. $f(x) = \begin{cases} x^2 & \text{if } x < 2 \\ 2x & \text{if } x > 2 \end{cases}$

2. $g(x) = \begin{cases} x^2 & \text{if } x \neq 1 \\ 3 & \text{if } x = 1 \end{cases}$

3. $f(x) = \begin{cases} 5 & \text{if } x > 0 \\ x+1 & \text{if } -2 \leq x \leq 0 \\ x^2 & \text{if } x < -2 \end{cases}$

4. $g(x) = \begin{cases} x+1 & \text{if } x < -1 \\ 3 & \text{if } -1 \leq x < 3 \\ x & \text{if } x > 3 \end{cases}$

1.



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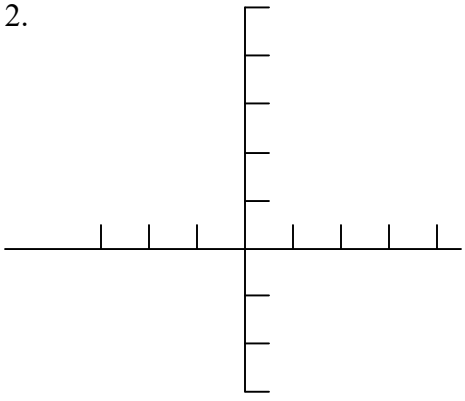

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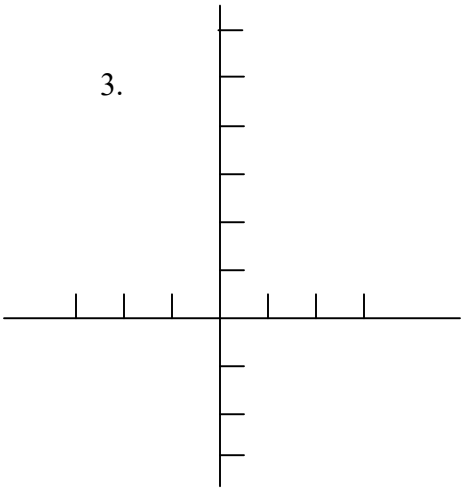

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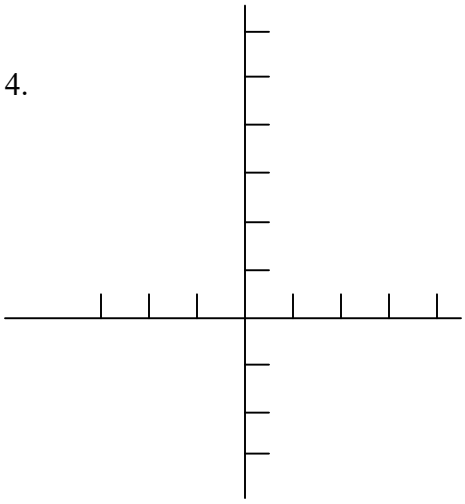


B. Interval Notation/Inequalities: (Do not use a calculator.)

Change from inequality notation to interval notation:

1. $-2<x\leq 1$ 1_____
2. $x>3$ and $x<12.4$ 2 _____
3. $x\leq 3$ or $x\geq 10$ 3_____
4. All real numbers except 2 and 4 4 _____
5. $x>4$ and $x<2$ 5_____
6. $x\leq 6$ and $x>-3$ 6_____

Change from interval notation to inequality notation: ($\cup$ -- or, $\cap$ - - and)

7. (-3,4] _____

8. $(-\infty, 4)\cup[10, \infty)$ _____

9. $(-\infty, -2)\cup(-2, \infty)$ _____

10. $(-\infty, 4)\cap[3,5]$ _____

Solve the following inequalities. Give answer in both forms:

	Inequality form	Interval Notation
11. $x + 7x - 8 \leq 0$	_____	_____
12. $x^2 + 7x - 8 \leq 0$	_____	_____
13. $x^2 - 3x - 4 > 0$	_____	_____
14. $x^2 - 3x + 4 > 0$	_____	_____
15. $x - 3x - 4 \geq 0$	_____	_____
16. $\lvert x-2\rvert < 5$	_____	_____
17. $\lvert x-2\rvert > 5$	_____	_____
18. $2(x - 3) + 4(x - 5) \geq 7x$	_____	_____
19. $\frac{5(x+2)}{(x-1)(x-3)} \geq 0$	_____	_____

C. Domain/Range : (Do not use a calculator. Skip the range in #5, 6, 8, 15.)

Find the domain and range for the following functions:

	Domain	Range
1. $y = x^2 + 5$	_____	_____
2. $y = \sqrt{x+5}$	_____	_____
3. $y = \sqrt{x^2-9}$	_____	_____
4. $y = \frac{1}{x-3}$	_____	_____
5. $y = \frac{5}{x^2+3x-4}$	_____	xxxxxxxxxxx
6. $y = \frac{5}{x^2+3x}$	_____	xxxxxxxxxxx

7. $y = \frac{2x-5}{x-3}$ _____ _____

8. $y = \frac{5}{x^2+3}$ _____ xxxxxxxxxxx

9. $y = \sqrt{x^2-3x}$ _____ _____

10. $y = \sqrt{16-x^2}$ _____ _____

11. y = e^(x + 1) _____ _____

12. y = e^x + 1 _____ _____

13. y = 5sinx _____ _____

14. y = 5sinx + 4 _____ _____

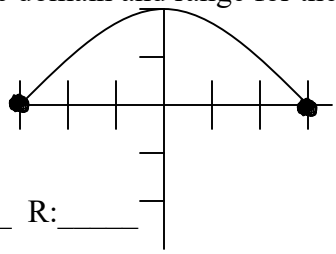
15. $y = \sqrt{\frac{x}{x^2-9}}$ _____ xxxxxxxxxxx

Give me a function whose domain is the following:

16. All real numbers except 2 _____ 17. $x \geq 5$ _____

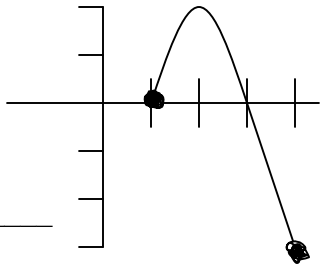
Give the domain and range for the functions graphed below:

18.



D:_____ R:_____

19.

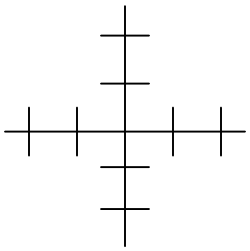


D:_____ R:_____

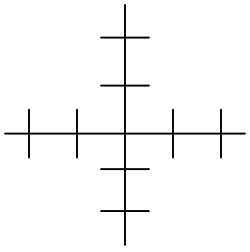
D. Graphs of functions: (Do not use a calculator.)

1. Graph the following:

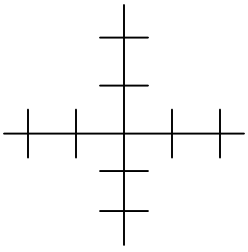
A. $y = \frac{x^2-1}{x-1}$



B. $y = \frac{|x-1|}{x-1}$

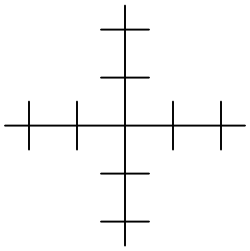


C. $y = \frac{x^2-3x+2}{x-1}$

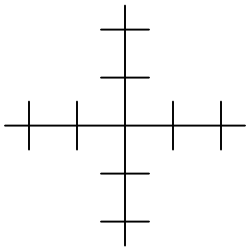


2. Sketch the following functions and label the vertex.

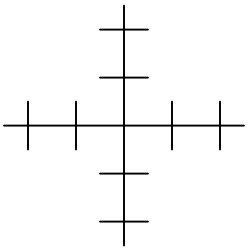
A. $y = |x| + 2$



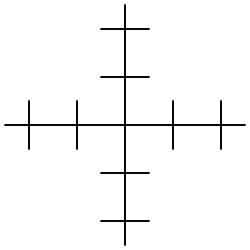
B. $y = -x^2 + 2$



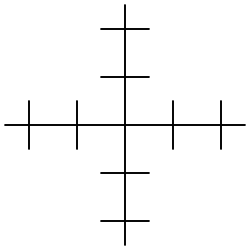
C. $f(x) = (x - 1)^3$



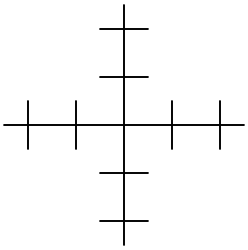
D. $y = -\sqrt{x+2} - 1$



E. $y = -2|x+1|$



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



3. Find the domain/range and zeroes for:

A. $f(x) = \begin{cases} x+1 & \text{if } x \leq 0 \\ 3 & \text{if } 0 < x \leq 1 \\ x^2 & \text{if } x > 1 \end{cases}$

D: _____

R: _____

Z: _____

B. $f(x) = \begin{cases} x^2 & \text{if } x < 1 \\ -2 & \text{if } x > 1 \end{cases}$

D: _____

R: _____

Z: _____

E. Operations on Functions: (Do not use a calculator.)

1. If $f(x) = \frac{1}{x+2}$, $g(x) = \frac{4}{x-3}$, and $h(x) = 7x + 4$, then find:

A. $(f+g)(x)$ = _____

B. $f(g(x))$ = _____

C. $f(h(x))$ = _____

D. $(f - g)(x)$ = _____

E. $f(g(h(-1)))$ = _____

F. $f\left(\frac{1}{g(2)}\right)$ = _____

2. If $f(x) = 2x - 3$, $g(x) = x^2 - 2$, and $i(x) = \sqrt{x} + 1$, then find:

A. $f(a+1) =$ _____ B. $g(a+1) =$ _____

C. $f(g(2)) =$ _____ D. $g(i(9)) =$ _____

E. $(f+g)(2) =$ _____ F. $(f \bullet g)(2) =$ _____

G. $(f/g)(2) =$ _____ H. $(f - i)(1) =$ _____

I. $g(g(x)) =$ _____ J. $f(f(x)) =$ _____

K. $f(g(x)) =$ _____ L. $g(f(x)) =$ _____

M. $g(i(x)) =$ _____ N. $f(g(i(4))) =$ _____

O. $(f - g)(x) =$ _____ P. $f(g(i(x))) =$ _____

Q. $\frac{f(x+h)-f(x)}{h} =$ _____ R. $\frac{g(x+h)-g(x)}{h} =$ _____

3. If $f(x) = x^2 + 3x + 5$, then find:

A. $\frac{f(x+h)-f(x)}{h} =$ _____ B. $\frac{f(3+h)-f(3)}{h} =$ _____

4. If $f(x) = 2x - 3$ and $g(x) = (x + 3)/2$, then find:

A. $f(g(x)) =$ _____ B. $g(f(x)) =$ _____

C. $f(g(7000)) =$ _____ D. $(f+g)(x) =$ _____

E. f(x) and g(x) share a special relationship. These functions are _____ of each other.

F. Trig Review: (Only use your calculator on #6 and #7. All identities given below are not required to be memorized.)

Given Identities: $\sin(2x) = 2\sin x\cos x$ $\cos(2x) = \cos^2 x - \sin^2 x$
$\sin(A+B) = \sin A\cos B + \sin B\cos A$ $\sin(A - B) = \sin A\cos B - \sin B\cos A$
$\cos(A+B) = \cos A\cos B - \sin B\sin A$ $\cos(A - B) = \cos A\cos B + \sin B\sin A$

1. Change $-\pi/4$ to degrees and find a positive coterminal angle.

2. If tanx = 3 in quadrant I, then find the other trig functions: (Hint: Draw a triangle)

sin x = ___ cos x = ___ csc x = ___ sec x = ___ cot x = ___

3. Find the following values without a calculator: Draw the 30/60/90 and 45/45/90 triangles in the margin.

$\cos(\pi/3)$ = _____ tan 45° = _____ sin 60° = _____

$\sin(\pi)$ = _____ $\sin(2\pi/3)$ = _____ $\cos(5\pi/6)$ = _____

4. Find cos 225° and show all work. (Show the angle drawn in the correct quadrant.)

5. Find 2 values of x on [0°, 360°], such that sin x = ½.

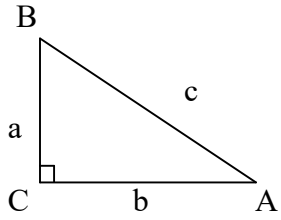
6. Find 2 values of x on [0°, 360°], such that cos x = - 0.8123 (Use your calculator)

7. Find the rest of the triangle if A = 40°, C = 90° and b = 6 (Use calculator)

a = ___ A = ___

b = ___ B = ___

c = ___ C = ___



8. If cos x = -15/17 and tan x < 0, find csc x.

9. Evaluate cos 120° using its reference angle. Show your drawing:

10. In what 2 quadrants is cot negative? ___ ___

11. Use trig identities to simplify the following trig expressions:
A. $\tan^2 x - \tan^2 x \sin^2 x$ = _____ B. $(\cos x - \sin x)^2$ = _____

12. True or false: Explain if false.

A. $\sin x \bullet \csc y = 1$ _____ B. $3\sec x = \dfrac{1}{3\cos x}$ _____

13. Solve for values on [0°, 360°] for $2\sin x + 1 = 0$

14. Solve $2\sin x + \sin(2x) = 0$ on $[0, 2\pi]$

Omit this problem for Summer 2021

15. If $\cos x = 5/13$ and $270° < x < 360°$, then find:
A. $\sin(2x)$ = _____ B. $\cos(2x)$ = _____

Omit this problem for Summer 2021

16. Find $\cos 15°$ exactly. (Hint 60 – 45 = 15)

Omit this problem for Summer 2021

G. Simplifying Complex Fractions and Rational Expressions: (Do not use a calculator.)

Simplify the following (Find a common denominator in #10, 18-20)

1. $\dfrac{\frac{3}{x}}{y}$ = _____ 2. $\dfrac{\frac{3}{x}}{\frac{y}{x}}$ = _____ 3. $5x^{-2}$ = _____

4. $(5x)^{-2}$ = _____ 5. $\dfrac{\frac{5}{x}+3}{y}$ = _____ 6. $\left(9x^2\right)^{-\frac{1}{2}}$ = _____

7. $(\sin x)\bullet x + x^2$ = _____ 8. $(\sin x)\bullet x\bullet\cos x\bullet\sin x$ = _____

9. $\sqrt{x}\left(x + x^{-\frac{1}{2}}\right)$ = _____ 10. $7x^{-\frac{1}{2}} + 3x^{\frac{1}{2}}$ = _____

11. $\dfrac{4x(2x-5) - (x^2 - 5x)\bullet(4)}{(2x-5)^2}$ = _____

12. $\dfrac{4(x-3)\bullet 2x - 5x\bullet\left(\dfrac{1}{x+3}\right) + 24x}{y}$ = _____

13. $(\sin x)(\cos x)(\sec x)\bullet 7 + x^2(\tan x)(\sec^2 x)\bullet 5x$ = _____

14. $x \bullet e^x \bullet \frac{1}{2} x^{-\frac{1}{2}} - \sqrt{x} \sin x \bullet \left(-3x^{\frac{1}{2}} \right) =$ _____

15. $\dfrac{\frac{7x}{y} + \frac{2}{a}}{x+3} =$ _____ 16. $\dfrac{\frac{7x}{y} - \frac{5}{3x}}{10} =$ _____

17. $\dfrac{\frac{2x}{3} - y^{-1}}{8 - \frac{2}{y}} =$ _____ 18. $\dfrac{4x}{2x-5} - \dfrac{3}{x-2} =$ _____

19. $\dfrac{7}{a-3} - 4 =$ _____ 20. $\dfrac{5}{\sqrt{z+1}} + \sqrt{z+1} =$ _____

H. Graphing Calculator Exercises: (A graphing calculator is required.)

1. Enter the following in the calculator exactly as written. Write each in standard notation and give the answer to each. (Note the use of parenthesis in the graphing calculator.)

A. -3^2 =___ B. (-3)^2 =___ C. $\sqrt{}$ (1 + 3) =___

D $\sqrt{}$ (1) + 3 =___ E. 1/3 + 5 =___ F. 1/(3 + 5) =___

2. Add 1/25 + 3/64 in the calculator. (Enter them in as you see them with the divide key. Once you get the decimal, use the key under the MATH menu FRAC, which will change it to a fraction. On some graphing calculators, if you use 2nd and divide instead of divide, it will make it a fraction.)

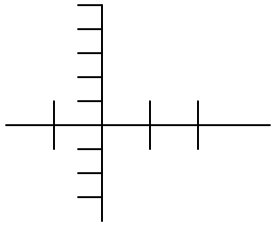
decimal: _____ fraction: _____

3. Find sin 90 in both degrees and radians. (In the MODE menu, there is a place to change from degrees to radians. Just scroll down to the appropriate one and hit enter.)

sin 90 (in degrees) = _____ sin 90 (in radians) = _____

4. Graph $y = x^2 + 1$ with x on [-1,2] and y on [-5,5]. (Use the WINDOW key and set xmin = -1, xmax = 2 xscl = 1, ymin = -5, ymax = 5 and yscl = 1. Then, hit the Y= key and enter in the function. Press graph.)

Draw the picture here:



5. Get a table of values for the function $y = x^2 - 3$ starting at 1 and going to 2, skipping by 0.1 each time. (Hit the TABLESET button and enter in starting table= 1 and Δtable = 0.1. Then enter the function above with the Y= key and push 2nd and GRAPH, which should be the TABLE button.)

Make your chart here:

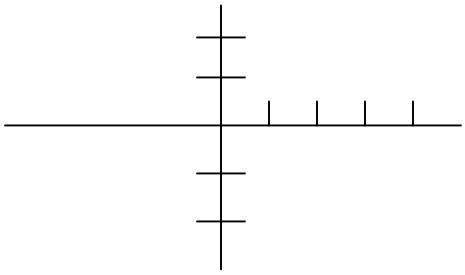
x	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2
y											

6. I want to know the 2 roots of $y = x^2 - 3$ to the nearest hundredths place. (Graph the function on the interval [-5,5] by [-5,5], by changing the window.) Use the zero feature: Once the graph is on the screen, select ZERO under the CALC (2ND and TRACE) menu. It is #2 on TI-83's. It will ask for a left bound and then a right bound and finally guess. Pick a value to the left and then to the right of the root. Lastly, put the cursor as close to the root as possible when prompted guess. (Remember the root is where the graph touches the x-axis and is the solution to the equation $x^2 - 3 = 0$.) Give 3 places after the decimal point for accuracy.

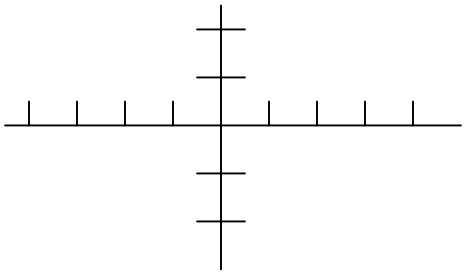
Answers: _____ _____

7. Graph y = sin x on two different intervals by changing the WINDOW to the x by y given:

A. in radians on [0,2π] by [-2,2], with XSCL = π/2 and YSCL = 1



B. in degrees on [-360,360] by [-2,2] with XSCL = 90 and YSCL = 1



8. By graphing the following functions, give their domain and range:

*A. $y = \sqrt{9 - 9x^2}$ {Enter in as $\sqrt{\ }$ (9 -9x^2)}

d: _____r: _____

B. $y = \sqrt{x - 3} + 1$ {Enter $\sqrt{\ }$ (x-3)+1}

d: _____ r: _____

C. $y = \sqrt{3 - x} + 1$

d: _____r: _____

D. $y = x^2 - 4x + 5$

d: _____ r: _____

*For 8a, zoom in on the graph by adjusting the window until you see the semi-ellipse touch the x-axis twice. Use your knowledge of domain and range to check your work. No decimal answers.)

9. Find the roots of $y = x^2 - 16$ (Use the ZERO button)

_____

10. Find the roots of $y = x^3 + x^2 - 17$ (Use the ZERO button. Give 3 places after the decimal point for accuracy.)

_____

11. . Solve for at least one solution of each of the equations below using your calculator. All answers must be accurate to three decimal places and should include a quick sketch. Your calculators must be in radians. For the third one, get it equal to zero first. (Use the zero button. Give 3 places after the decimal point for accuracy.)

A. $x^7 - 11 = 0$ B. $\sin(x^2) + x - \cos x = 0$ C. $\cos x = \sin x + x$

_____ _____ _____

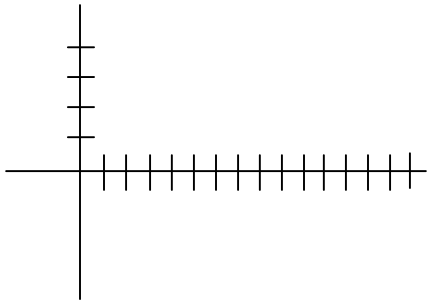
12. Graph the following functions and tell the difference the parenthesis makes in each problem. Rewrite the equations without parenthesis in standard notation:

A. $y = 1/x + 2$ A_____

B. $y = 1/(x + 2)$ B_____

13. The profile of a road in miles is given by P(x) below.

$$P(x) = \begin{cases} 3 + .04\cos(2x) & \text{if } 0 \le x \le 10 \\ \text{Bridge!!!!} & \text{if } 10 < x < 10.04 \\ 3.02 + 0.005(x - 11) & \text{if } x \ge 10.04 \end{cases}$$



A. Sketch the road.

B. What is the height of the bridge on each side? _____ _____
(Give 3 places after the decimal point for accuracy.)

C. Approximate the slope of the bridge.
(Give 3 places after the decimal point for accuracy.) _____