AP Calculus Summer Assignment 2021-2022

This assignment must be turned in on the first day of class. The exception is if you are new to our district and obtained the assignment after August 9, 2021 (In which case it is due the second Monday of School). You must show all your work. This will be counted as your first quiz grade and will be graded on effort and completion. If you have any questions, please email me. Sugalskm@manateeschools.net

1. Please check out our textbook from the media center: Calculus a single Variable by Larson and Edwards
2. Please have the attached Pre-Calculus review problems completed with all work shown for the non-calculator sections.
3. Memorize the unit circle in radians (coordinates of the special right triangles) Also, review your Pythagorean identities and your double and half angle formulas for sine, cosine and tangent. You will have a timed quiz on the unit circle the first week of school (120 seconds). You will have a quiz on the identities and formulas the second week of school.
4. You must have your own graphing calculator for this course. The AP Exam requires that you be proficient in the use of the graphing calculator. I will be using a TI84 and 83 Plus in class. If you choose not to purchase your own, you must check one out of the Media Center.
5. Please review these dates:

   Mock AP Exam if needed Saturday 4/16/22 at 9 am.

   AP Exam: In the first two weeks of May.
6. Boot Camps: to be determined (depends if we have any hurricane days)

Please email me if you have any questions.

Circuit Training – Precal / Trig Review **NO CALCULATOR!** ☺ Name ____________________

Directions: Beginning in cell #1, read the question and show the work necessary to answer it (attach separate sheets if necessary). Search for your answer and call that cell #2. Continue in this manner until you complete the circuit. Note: The last question will not have a match!

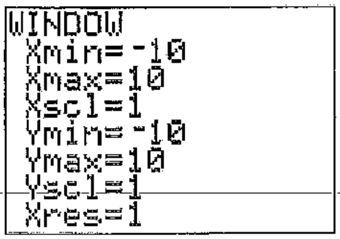
# 1 Find the slope of the line which connects the point (b, 3b) to the point (3b, 6b). [Note: b≠0.]	Answer: $\frac{-1+\ln 3}{2}$ # ____ The graph of $y = 2\sin(3x - \frac{\pi}{2})$ has an amplitude of _____, a period of _____, and a phase shift of _____ to the _________ (left/right) when compared to the graph of y = sinx.
Answer: $\frac{2e}{1-e}$ # _____ As x grows infinitely large, the value of $h(x) = \frac{2x}{5x+8}$ approaches what number?	Answer: 4/5 # _____ Find the average rate of change of $w(x) = 3x^2 + 1$ over the interval [-1, 4].
Answer: 75 # _____ For $\frac{\pi}{2} \le A \le \pi$, $\sin A = \frac{3}{5}$. Find $\sin(2A)$.	Answer: 9 # _____ If $f(x) = \ln x$ and $g(x) = e^{x+1}$, find $f(g(2)) - g(f(e))$.
Answer: 21 # _____ $f(x) = g^{-1}(x)$ and $g(x) = \frac{2x}{x-1}$; $f(5) = ?$	Answer: $(-\infty, 2) \cup (2, \infty)$ # _____ $\log_{10}25 + \log_{10}4 =$
Answer: [-2, 2] # _____ Solve for x: $e^{2x+1} - 3 = 0$	Answer: x = -3 # _____ State the domain of $y = \ln(x-2)$.
Answer: 2/5 # _____ The expression $3x^2$ is used to calculate the slope at any point on the graph of the function $g(x) = x^3 - 1$. Write the equation of the line tangent to g(x) at its x-intercept.	Answer: 3/2 # _____ The linear function f(x) is parallel to the line $y = \frac{4}{5}x - 7$ and passes through the point (-5, 0). What is f(-6)?

Answer: -4/5 # _____ The quadratic function g(x) has a vertex at (-5, 0) and y-intercept of (0, -5). What is g(1)?	Answer: 2 # _____ The graph of $g(x) = -\sqrt{4-x^2}$ is a semicircle in quadrants III and IV. Find the domain of $g(x)$.
Answer: 4 # _____ Simplify the expression $\frac{x^3+125}{x+5}$ and then evaluate the resulting expression for x = -5.	Answer: 26 # _____ Find $x^2 - y^2$ given that x + y = 7 and x − y = 3.
Answer: $3 - e^2$ # _____ Given $f(x) = x^2 + 5$, find $\frac{f(3+h)-f(3)}{h}$ $(h \neq 0)$.	Answer: 36 # _____ State the range of $w(x) = \frac{2x+1}{x+3}$.
Answer: x > 2 # _____ $81^{\frac{3}{4}} + 8^{\frac{2}{3}} + 125^{\frac{1}{3}}$	Answer: -24/25 # _____ The graphs of $g(x) = \ln(x+3)$ and $f(x) = \frac{2x+1}{x+3}$ have the same vertical asymptote. What is it?
Answer: 5/3 # _____ Solve for x: $\ln(x) - \ln(x+2) = 1$	Answer: y = 3x − 3 # _____ Evaluate g(x) = 5sinx + cos(2x) for x = $\frac{\pi}{2}$.
Answer: -36/5 # _____ Find the average rate of change of the function $p(x) = \frac{4}{5}x - 2$ from x=0 to x=15.	Answer: 6 + h # _____ If the perimeter of a rectangle is 68 and the width is 10, find the length of a diagonal.

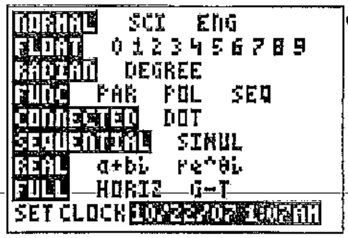
TI-83/84 Plus Graphing Calculator Worksheet

The graphing calculator is set in the following WINDOW, MODE, and Y=, settings. Resetting your calculator brings it back to these original settings.

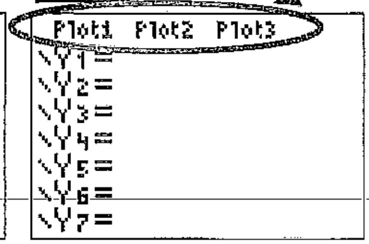
WINDOW



MODE



Y=



Note that all Plots are **NOT highlighted**. If any of them is highlighted, then use the arrow keys to go up / and right

Press to deselect **ENTER**

WINDOW Notation x: $[x_{min}, x_{max}, x_{scl}]$ and y: $[y_{min}, y_{max}, y_{scl}]$

Original Setting x: $[-10, 10, 1]$ and y: $[-10, 10, 1]$

Resetting Calculator to Factory Setting:

- when the user have used the calculator in various ways and it is difficult to go back to the original setting.
- when the user lend the calculator to others and they have messed up the original setting.
- this should be done before a test or after you lend the calculator to a friend

2nd **MEM** "
+

Select Option 7

ENTER

Select Option 1

ENTER

This will also delete all your entries like equations in Y= screen as well as data in the STATS screen

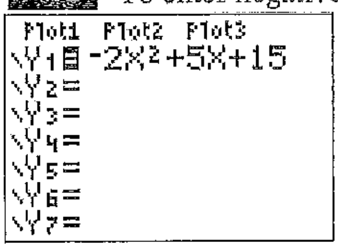
Adjusting WINDOW of a graph:

Sometimes, a graph needs to be set with a customize WINDOW. This is similar to setting the intervals and the ranges for both x- and y- axis.

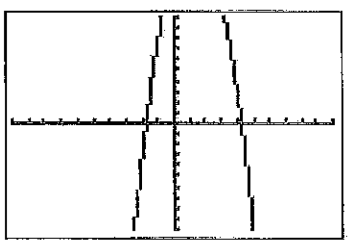
Example 1: Graph $y = -2x^2 + 5x + 15$.

Y= To enter negative sign, press **(–)**

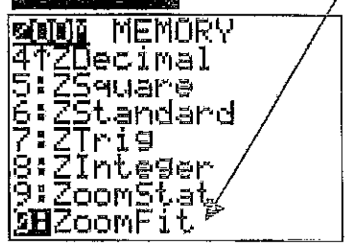
To enter X, press **X,T,θ,n**



GRAPH



ZOOM

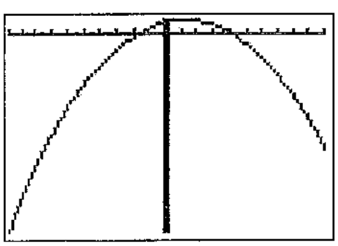


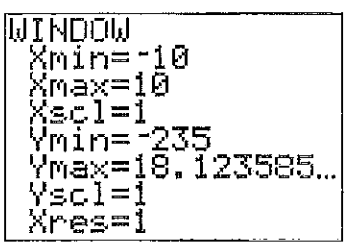
Scroll down with

and press ENTER

or Select Option 0

Note: We use the subtraction button **–** between terms. Otherwise, we use **(–)** for negative signs.

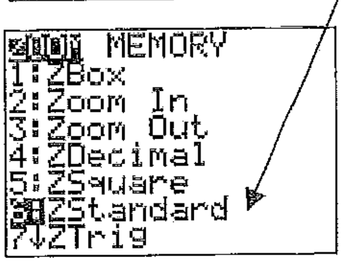




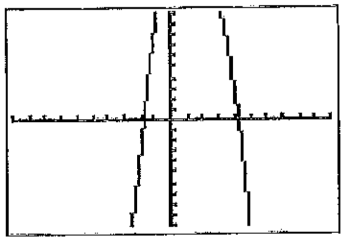
The ZoomFit option does not give a neat WINDOW setting, but it allows us to see the whole graph

To quickly reset the original WINDOW setting without resetting the entire calculator:

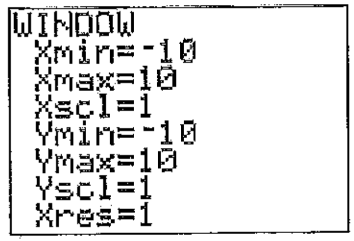
ZOOM



Scroll down with ▼ **and press ENTER or Select Option 6**



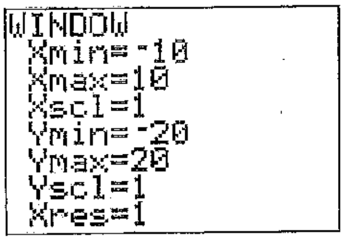
WINDOW



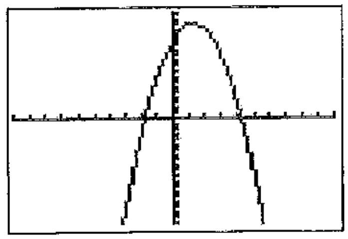
Note the WINDOW goes back to the original setting.

Now, we try using a customize WINDOW setting to x: [–10, 10, 1] and y: [–20, 20, 1].

WINDOW



GRAPH



Note that now the graph fits nicely.

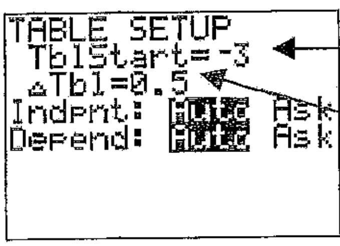
Example 2: Using the graph $y = -2x^2 + 5x + 15$ from the previous example,

a. Create a table of values starting at $x = -3$ with an increasing interval of 0.5.
b. Trace the graph and find the value of y when $x = 5$ from the graph.
c. What is the y-intercept of this graph?
d. Determine the x-intercepts.
e. Give the coordinates of where the maximum value of this graph occurs.
f. Solve $-2x^2 + 5x + 15 > 0$ and then solve $-2x^2 + 5x + 15 \leq 0$.

a. **To create and customize a Table of Values**:

2nd

TBLSET
WINDOW

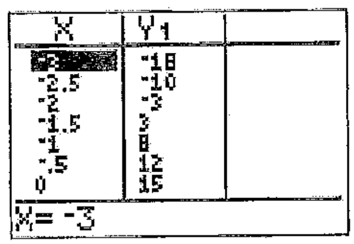


Set Table Start to –3

Set Table Interval to 0.5

2nd

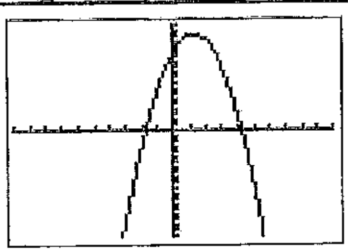
TABLE
GRAPH



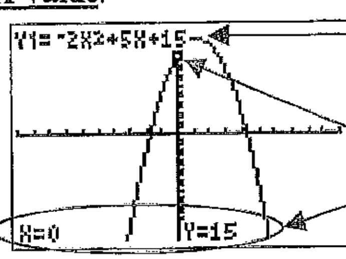
We may scroll up and down using ▲ ▼

b. **To Trace along a Graph and find a Y-value from an X-value**:

GRAPH



TRACE

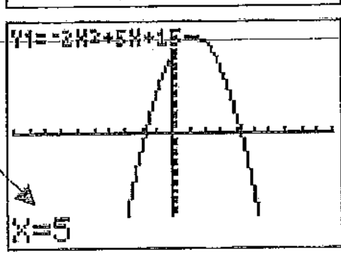


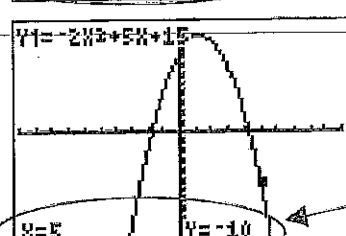
The equation is displayed on top.

Note the blinking cursor and the valued of the current x and y.

Enter 5 to input x-value

ENTER



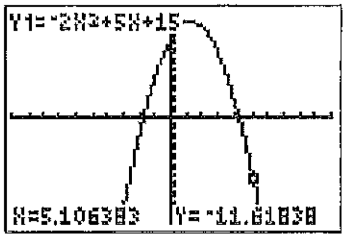


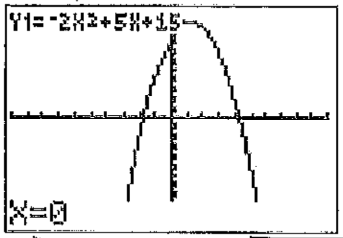
y-value of –10 is shown

c. **To find y-intercept, let $x = 0$**

Note the y-intercept of a quadratic equation is its constant value after we manipulate it to $ax^2 + bx + c = 0$.

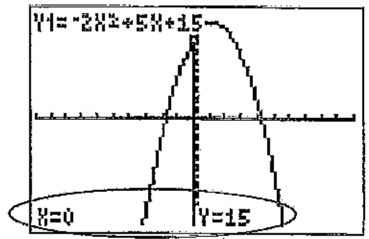
TRACE





Enter 0 to input x-value

ENTER

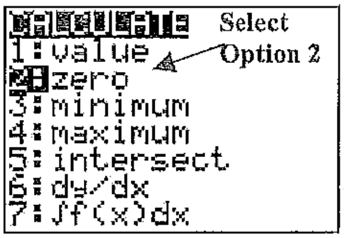


y-value of –15 is shown

d. **To find x-intercept, let $y = 0$**: This means using the ZERO function.

2nd

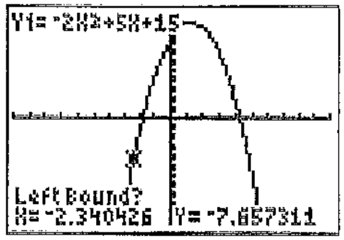
CALC TRACE



Select Option 2

Use [left arrow] and take the cursor to the left of the first x-intercept.

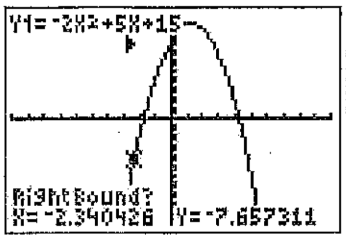
ENTER



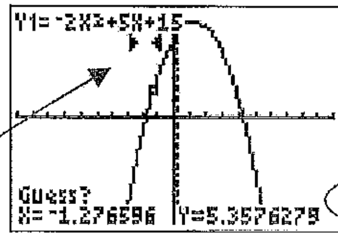
Zero = x-intercept = Solution = Root

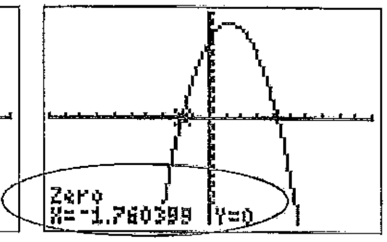
Use [right arrow] and take the cursor to the right of the first x-intercept.

ENTER



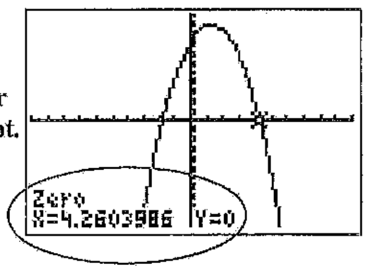
Press **ENTER** again.





Note the two little triangles that appear. They indicate the calculator will find the x-intercept within that range.

Do the same steps for the second x-intercept.

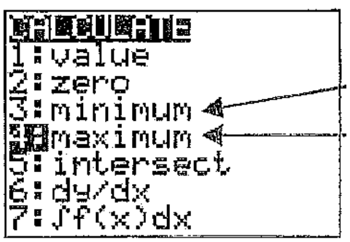


Because the original quadratic equation, $y = -2x^2 + 5x + 15$, is not factorable, these **solutions are the decimal equivalents of the roots found from the quadratic formula**. However, ***we prefer the exact values*** from the quadratic formula to their decimal equivalents.

e. **To find the coordinates of the Maximum (or the Minimum) of a Graph**:

2nd

CALC TRACE

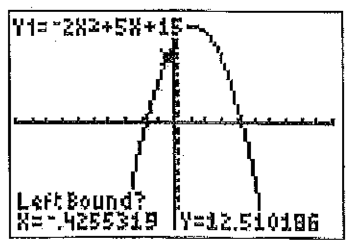


Select Option 3 for Minimum

Select Option 4 for Maximum

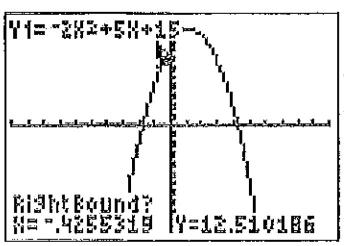
Use [left arrow] and take the cursor to the left of the Maximum point

ENTER

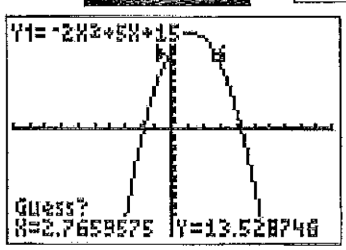


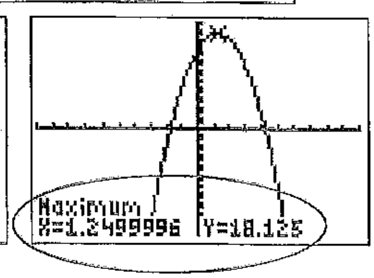
Use [right arrow] and take the cursor to the right of the Maximum point.

ENTER



Press **ENTER** again.

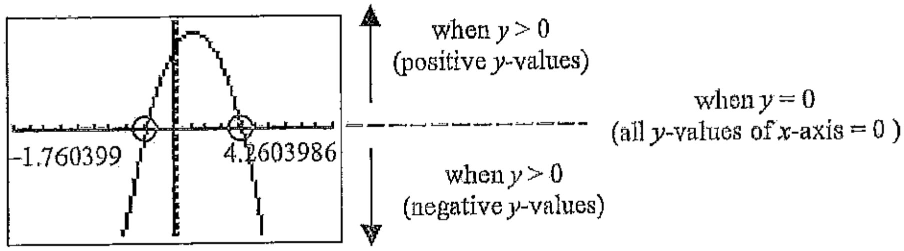




f. **Solve Inequalities from Graphing:** $(-2x^2 + 5x + 15 > 0)$ and $(-2x^2 + 5x + 15 \le 0)$

GRAPH

x: [−10, 10, 1]
and
y: [−20, 20, 1]



$$x\text{-intercepts} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(5) \pm \sqrt{(5)^2 - 4(-2)(15)}}{2(-2)} = \frac{-5 \pm \sqrt{145}}{-4} = \frac{5 \pm \sqrt{145}}{4}$$

$$x = \frac{5 - \sqrt{145}}{4} \approx -1.760399 \qquad x = \frac{5 + \sqrt{145}}{4} \approx 4.2603986$$

For $-2x^2 + 5x + 15 > 0$, it is the same as when $y > 0$.

Approx Solution: $-1.760399 < x < 4.2603986$

Exact Solution: $\frac{5 - \sqrt{145}}{4} < x < \frac{5 + \sqrt{145}}{4}$

For $-2x^2 + 5x + 15 \le 0$, it is the same as when $y \le 0$.

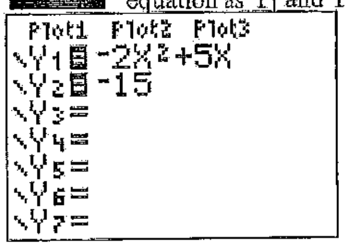
Approx Solution: $x \le -1.760399$ or $x \ge 4.2603986$

Exact Solution: $x \le \frac{5 - \sqrt{145}}{4}$ or $x \ge \frac{5 + \sqrt{145}}{4}$

Example 3: Solve $-2x^2 + 5x = -15$ using the INTERSECT function.

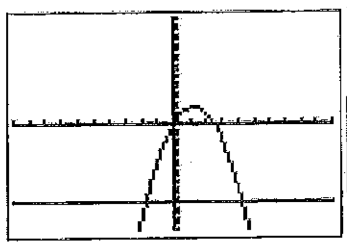
Using the INTERSECT function:

Y= Enter the two sides of the equation as Y_1 and Y_2

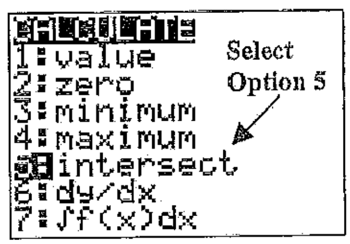


GRAPH

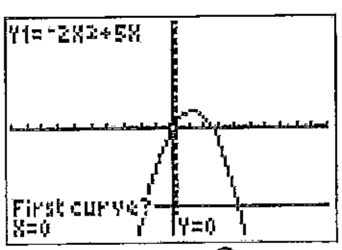
x: [−10, 10, 1]
and
y: [−20, 20, 1]

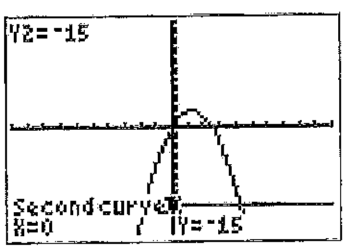


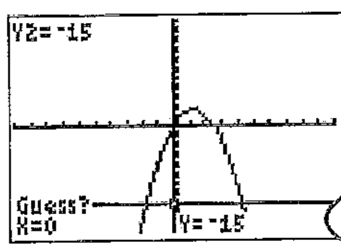
2nd **CALC** **TRACE**

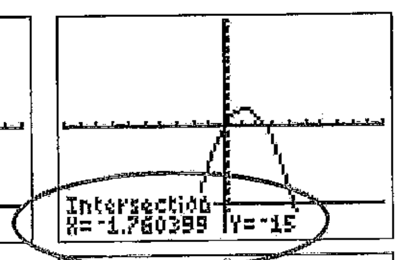


Select Option 5

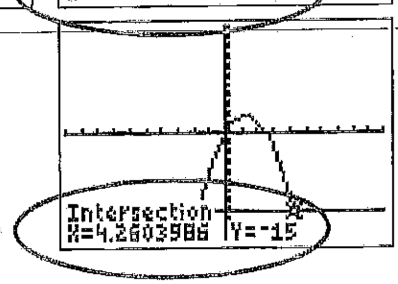








Take cursor close to the first intersecting point ◄ **ENTER** **ENTER** **ENTER**



Note that solutions for the equation, $-2x^2 + 5x = -15$, are the same as the zeros for $y = -2x^2 + 5x + 15$.

Do the same steps for the second intersecting point.

Exercise Questions

1. Graph $y = x^2 + 6x - 16$. Adjust the WINDOW to properly fit the graph.
   a. Trace the graph and find the value of y when $x = -7$ from the graph.
   b. What is the y-intercept of this graph? How is the answer compared to the constant of the equation?
   c. Determine the x-intercepts. How are they compared to solving the equation by factoring?
   d. Give the coordinates of where the minimum value of this graph occurs.
   e. Solve $x^2 + 6x - 16 \geq 0$.
   f. Solve $x^2 + 6x - 16 < 0$.

2. Solve all real solutions $x^3 + 3x^2 - 7x = 15$ to two decimal place by graphing $y = x^3 + 3x^2 - 7x - 15$ and determine its zeros. Adjust WINDOW accordingly.
   a. Why is find the zeros of $y = x^3 + 3x^2 - 7x - 15$ the same as solving the equation $x^3 + 3x^2 - 7x = 15$?
   b. Solve the equation, $x^3 + 3x^2 - 7x = 15$, again by using the intersect function of the calculator.
   c. Give the coordinates (to the two decimal place) where the minimum value of this graph occurs.
   d. Solve $x^3 + 3x^2 - 7x - 15 < 0$.

3. A number people were shipwrecked on an island. The population of the island slowly grew for 20 years until a passing boat rescued the people. The population on the island can be modeled by the formula, $P = 200(1.1)^t$, where P is the number of years on the island and t is the years that they have been shipwrecked.
   a. Why is $0 \leq x \leq 20$ an appropriate x range for your window?
   b. What is an appropriate y range? How will ZOOMFit set a good range for you after you have put in the x range (we used this on the last worksheet)?
   c. How many people were originally shipwrecked? What time is this?
   d. What is the population after 5 years? 18 years?
   e. When is the population 300? When is it 1000?

Answers

Circuit Training – Precalculus /Trig Review **CALCULATOR ACTIVE** Name ________________________

Beginning in cell #1, use a combination of analytic methods and a graphing calculator to solve the problem. Show how you arrived at your answer, even if a lot of your work was done on the calculator. Hunt for your answer and call this problem #2. Continue in this manner until you complete the circuit. Note: Answers are rounded or truncated to three decimal places. Also, make sure you know HOW to do these on the test when there are no answer choices!

Answer: 0.510 #1 Find the average rate of change for the function $f(x) = 3e^{-x}$ from $x = -1$ to $= 7$.	Answer: 1.771 # _____ The function $r(x) = \frac{x+2}{2x-3}$ has a horizontal asymptote of $y =$ _______.
Answer: −1.750 # _____ Find $f(g(-\frac{4\pi}{7}))$ if $f(x) = \begin{cases} \lvert x\rvert - 2, & x \le 0 \\ \frac{3}{x}, & x > 0 \end{cases}$ and $g(x) = \tan x$.	Answer: 5.832 # _____ Find the zero of $f(x) = 3 - 2^x$.
Answer: 1.585 # _____ Suppose the number of cases of a rare disease is able to be reduced by 25% annually. If there are 4000 cases nationwide, how many years will it take to reduce the number of cases to 300 ?	Answer: 1.500 # _____ The graph of an exponential function, $y = a \cdot b^x$, passes through the points $(1, 1)$ and $(2, 3.5)$. Find the value of a.
Answer: 0.500 # _____ If $f(g(x)) = g(f(x)) = x$, and $g(x) = 2 + \ln(x+1)$, find $f(4)$.	Answer: 9.899 # _____ A cone has a height which is one-sixth the radius. If the radius is two, what is the volume of the cone?
Answer: 1.396 # _____ $g(x) = \ln(x-4)$ and $f(x) = \frac{1}{2}x^2 + 3$. Find $f(g(6))$.	Answer: 0.685 # _____ A drug is administered intravenously for eight hours, $0 \le t \le 8$, and the function $f(t) = 32 - 8.2\ln(1+2t)$ gives the number of units of the drug in the body after t hours. How many units are present after 7 hours (at time $t = 7$)?

Answer: 9.004 # _____ What is the period of $y = \sin(4x)$?	Answer: -1.019 # _____ For $g(x) = -3x^2 + 5.2x + 7$, find the maximum value of the function.
Answer: 1.760 # _____ Solve for θ, $\frac{3\pi}{2} \leq \theta \leq 2\pi$. $cos\theta = 0.9$	Answer: 0.456 # _____ What is the minimum value of $y = -3\text{cos}t + 1.25$?
Answer: 9.794 # _____ The function $v(t) = -9.8t + 5$ gives the instantaneous velocity (in m/sec) of an object thrown upward with an initial velocity of 5 m/sec. At what time t does the object start falling?	Answer: 3.240 # _____ Solve the non-linear system $\begin{cases} y = \sqrt{x+2} \\ y = 1.1x^5 \end{cases}$. To advance in the circuit, locate the y-coordinate of the solution.
Answer: 9.253 # _____ An isosceles right triangle has a leg of 7 cm. What is the length of the hypotenuse, in cm?	Answer: 6.389 # _____ Solve $\sec(3x) = 5$ on the open interval $\left(0, \frac{\pi}{6}\right)$.
Answer: 0.286 # _____ $log_3 7$ = ?	Answer: 1.571 # _____ The function $f(x) = \frac{x+2}{2x-3}$ has a vertical asymptote at x = _______.