# AP CALCULUS SUMMER HOMEWORK 2019

Dear Parents of Calculus Students,

My name is David Murnane and I am the AP Calculus teacher for next year.  I have been teaching for 30 years, 15 years at Pittsburg High School and 14 years here at Freedom High School.  I have taught AP Calculus for 8 years at Pittsburg High School and I have now been blessed to teach AP Calculus for 13 years here at Freedom High School.

I cover all topics in the AP Calculus AB topic outline as they appear in the AP Calculus Course Description.  The major textbook is *Calculus—Graphical, Numerical, Algebraic* by Finney et. al.  Of course my main objective for my students is to do well on the AP exam but I also want my students to become better problem solvers using math and be able to explain solutions to each other.  I also want them to become adapt at using a graphing calculator as a tool and not as a crutch and to also be aware of the drawbacks and shortcomings of a graphing calculator.  My goal for my students is to learn to appreciate the power of calculus and to give them the tools necessary to be successful in future math classes.   My students know that they will work harder than they ever have before but I am here to help them and we will work together to succeed in calculus.

Each student is required to have a graphing calculator (TI-83 plus or higher recommended) and is expected to bring it to class everyday.  I use a TI-83 plus.  We use calculators on a regular basis to analyze and investigate problems both graphically and numerically.  Students are allowed to use calculators on some tests and quizzes but not all.

In order to get through all the material by May, I am going to assign homework over the summer.  This is not optional work.  This is the first major assignment for the class.  Students who do not do this assignment often do not recover and end up dropping the class.

Your son/daughter will need to get a Calculus book from school.  If you have any questions on the homework, I will be at school on Monday and Tuesday, July 22nd and 23rd from 10 am until 1 pm, in my class room P-13, to give them individual help.  You can also email me at murnaned@luhsd.net to ask questions and I will reply with helpful hints.  We will have the first test on the review material from chapter 1 on the 3rd class day that we come back.  This test will count towards their 1st quarter grade.

The summer homework is in two parts.

Part I (all exercises are in the Calculus book)

p. 7 #6-36 multiples of 3
p. 17 #3-45 multiples of 3 and #49 but not #36
p. 24 #3-33 multiples of 3
p. 39 #3-36 multiples of 3, 37, 38, but not #27 nor #30
p. 48 #1-32 all, but not #17 nor #19

These are all review problems from Precalculus and so their notes from last year should be helpful. This represents about 4-6 hours worth of work.

Part II is attached and is all about becoming more familiar with your graphing calculator and how functions are affected by different mathematical operations. This part represents about another 4-6 hours worth of work. If this is spaced out over the summer (or you could even start now) it is only 1.5 to 2 hours per week.

If your son/daughter is not able to get to this assignment during the summer then they should definitely ask themselves if they should be taking AP Calculus.

Good Luck next year,
David A. Murnane

For problems 1-17 graph the parent function of each set using your calculator. Draw a quick sketch on your paper of each additional equation in the family (***Use a different color for each equation on a graph***). Check your sketch with the graphing calculator.
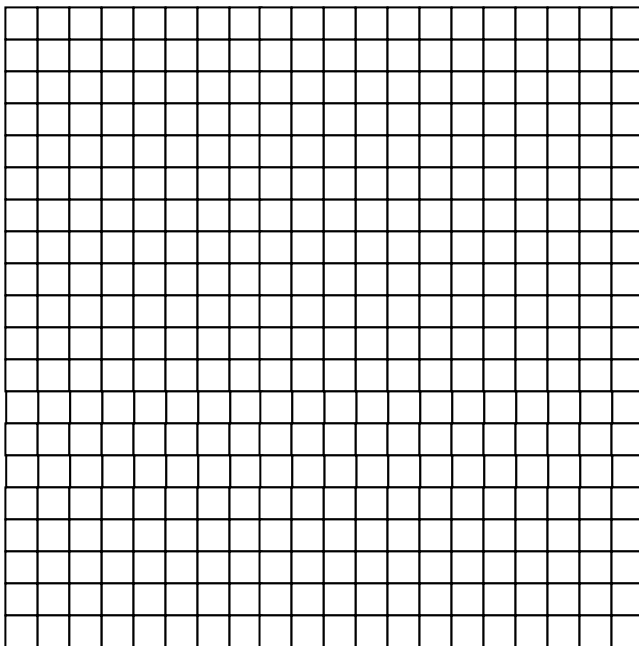
1) Parent Function: $y = x^2$

a) $y = x^2 - 4$
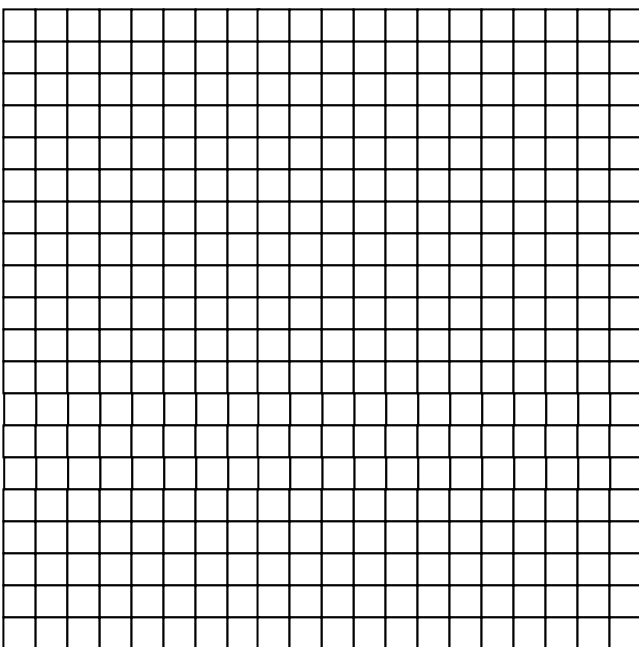
b) $y = x^2 + 3$

c) $y = (x-4)^2$

d) $y = (x+3)^2$

2) Parent Function: $y = x^2$

a) $y = 3x^2$

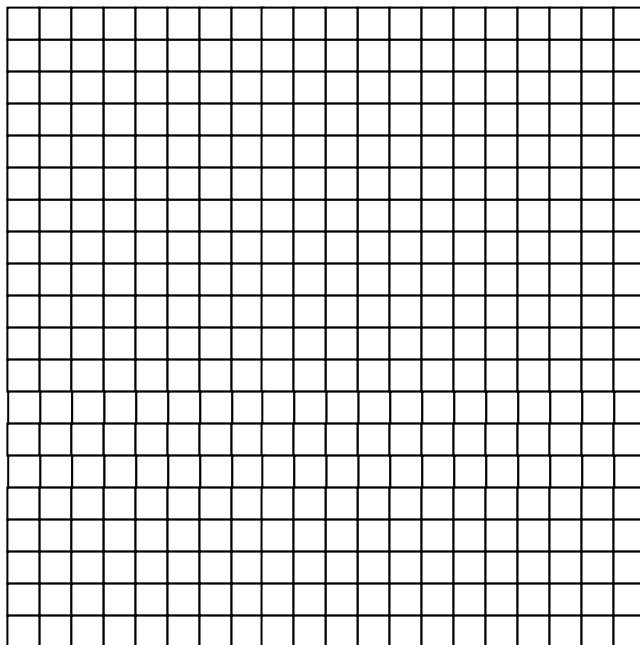b) $y = \frac{1}{4}x^2$

c) $y = -x^2$

d) $y = -(x+3)^2 + 4$

3) Parent Function: $y = x^2$

a) $y = (x+3)^2 + 5$

b) $y = -2(x+1)^2 + 4$

c) $y = \frac{1}{3}(x-3)^2 - 4$

d) $y = -3(x+2)^2 - 2$

4) Parent Function: $y = \sin x$ (set mode to RADIANS)

a) $y = \sin(2x)$

b) $y = \sin(x) - 2$

c) $y = 2\sin(x)$

d) $y = 2\sin(2x) + 2$
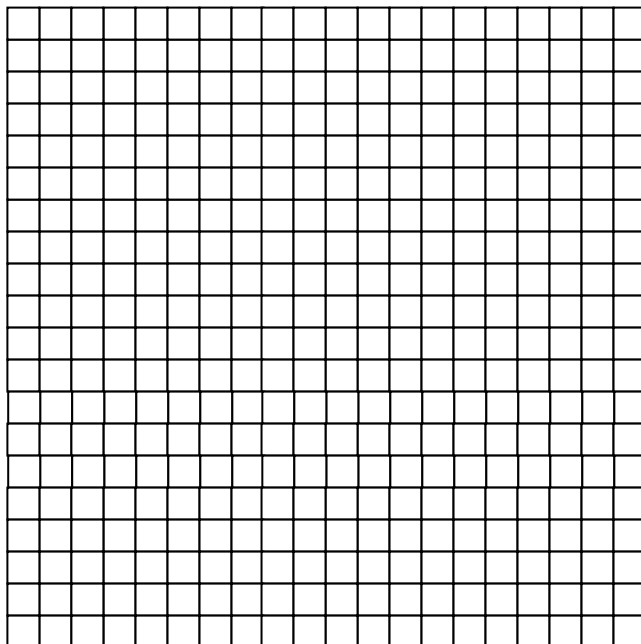
5) Parent Function: $y = \cos x$ (set mode to RADIANS)

a) $y = \cos(3x)$    b) $y = \cos\left(\frac{x}{2}\right)$    c) $y = 2\cos(x) + 2$    d) $y = -2\cos(x) - 1$
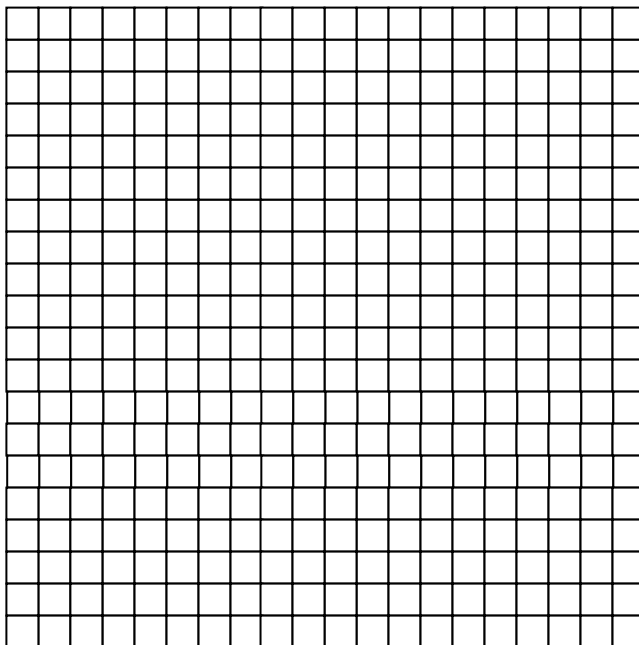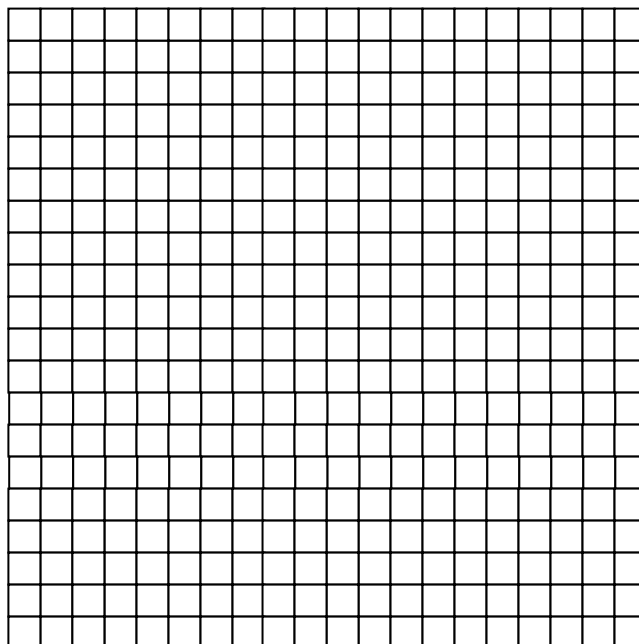
6) Parent Function: $y = x^3$

a) $y = x^3 + 2$    b) $y = -x^3$    c) $y = x^3 - 5$    d) $y = -x^3 + 3$

7) Parent Function: $y = x^3$

a) $y = (x-4)^3$

b) $y = (x-1)^3 - 4$

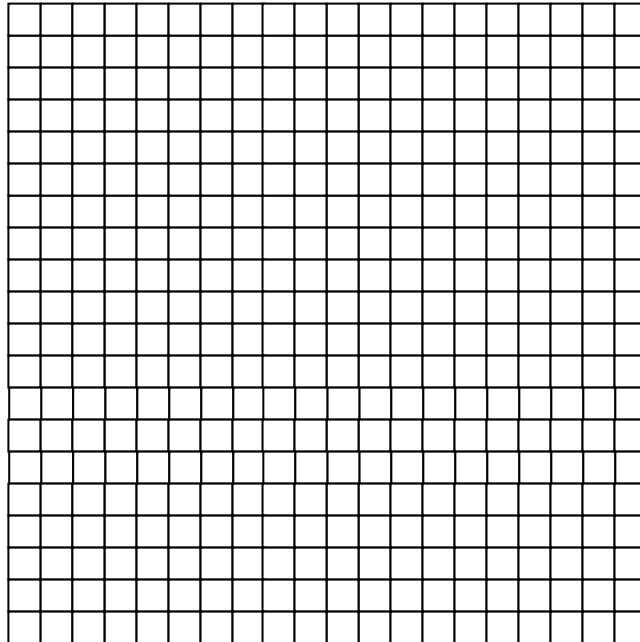c) $y = -2(x+2)^3 + 1$

d) $y = x^3 + x$
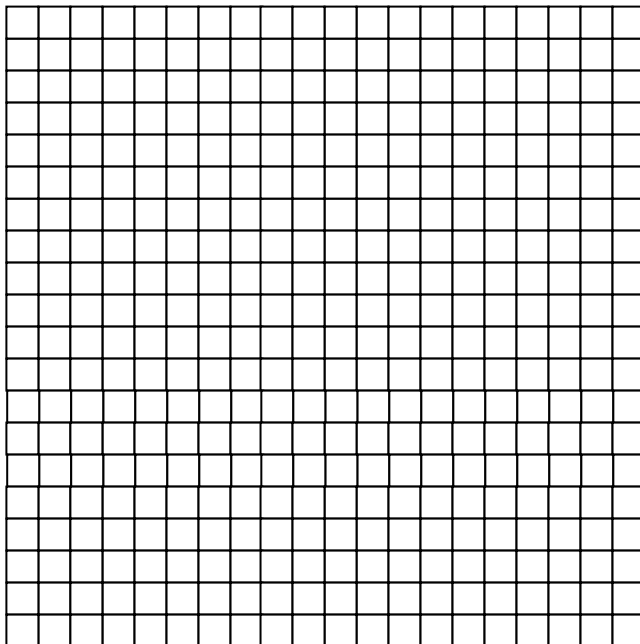
8) Parent Function: $y = \sqrt{x}$

a) $y = \sqrt{x} - 2$

b) $y = \sqrt{-x}$

c) $y = \sqrt{x} + 5$

d) $y = \sqrt{6-x}$
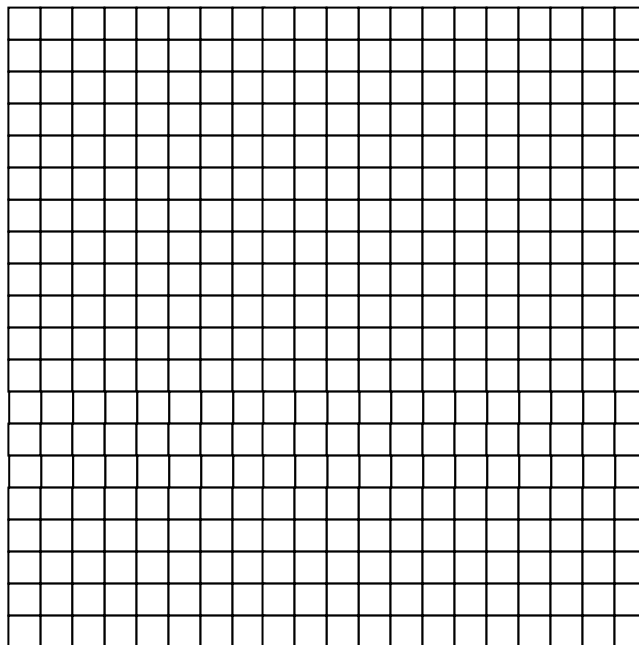
9)   Parent Function: $y = \sqrt{x}$

a)   $y = -\sqrt{x}$         b)   $y = -\sqrt{-x}$         c)   $y = \sqrt{x+2}$         d)   $y = \sqrt{2x-6}$
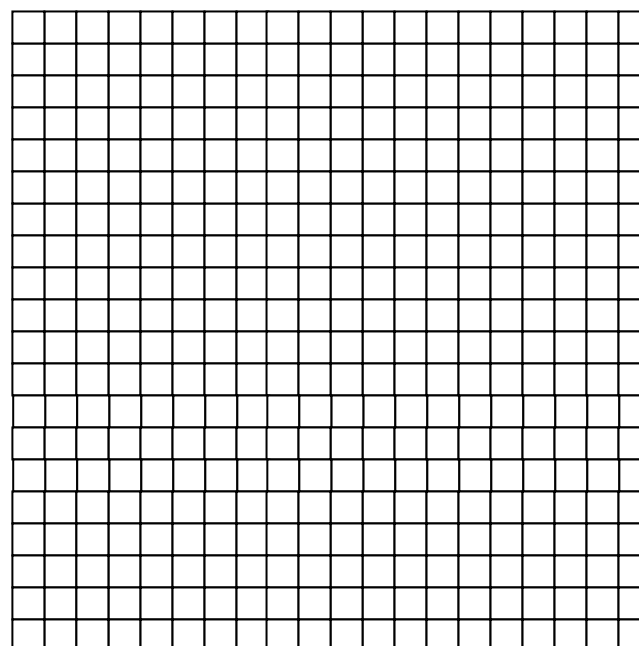
10)   Parent Function: $y = \sqrt{x}$

a)   $y = -2\sqrt{x}$         b)   $y = -\sqrt{4-x}$         c)   $y = -\frac{1}{2}\sqrt{x+2} - 5$         d)   $y = 2\sqrt{x-3} + 4$
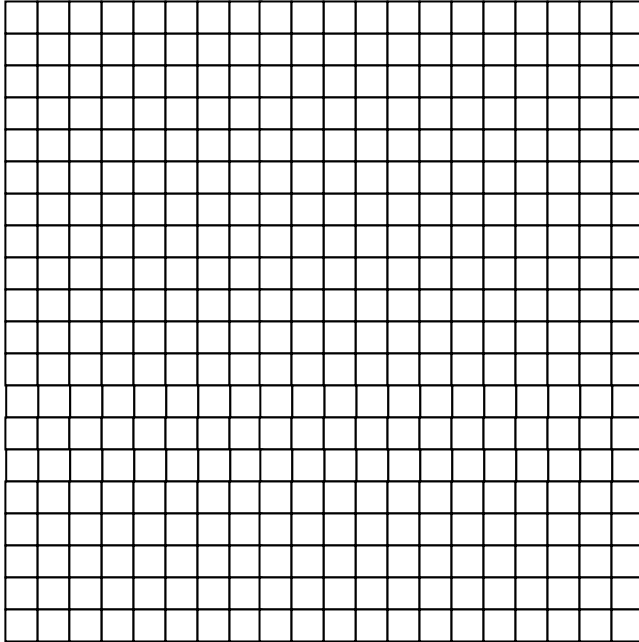
11) Parent Function: $y = \ln x$

a) $y = \ln(x+3)$

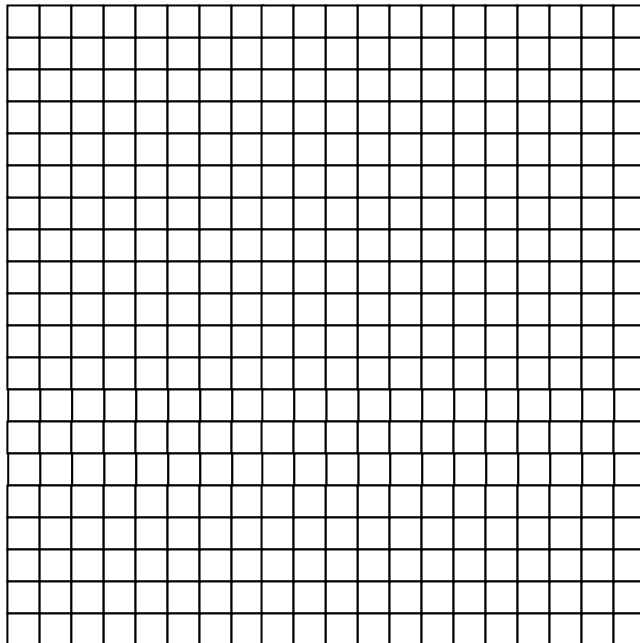b) $y = \ln(x)+3$

c) $y = \ln(x-2)$

d) $y = \ln(-x)$

12) Parent Function: $y = \ln x$

a) $y = -\ln(x)$

b) $y = \ln(|x|)$

c) $y = \ln(2x)-4$

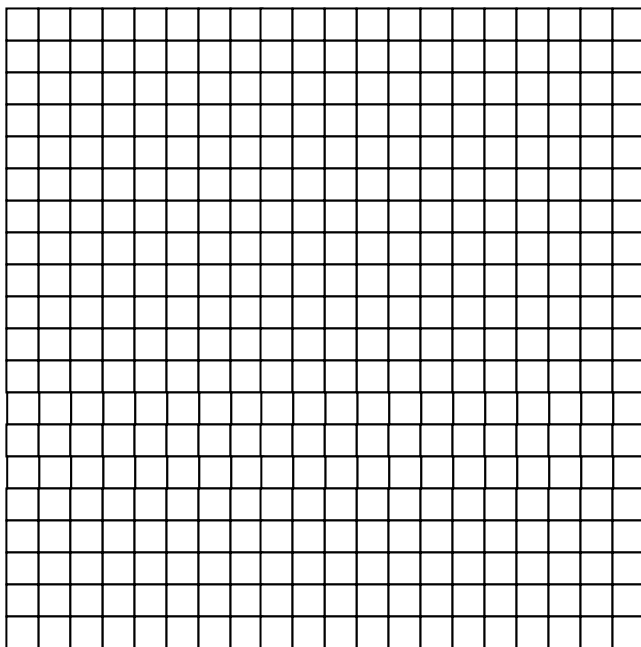d) $y = -3\ln(x)+1$

13) Parent Function: $y = e^x$

a) $y = e^{2x}$       b) $y = e^{x-2}$       c) $y = e^{2-x}$       d) $y = e^{2x} + 3$
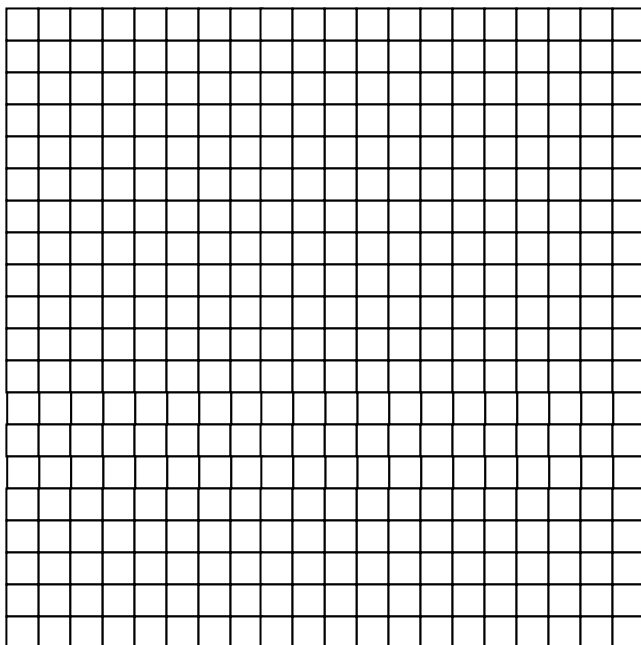
14) Parent Function: $y = e^x$

a) $y = -e^x$       b) $y = e^{-x}$       c) $y = 2 - e^x$       d) $y = e^{0.5x}$
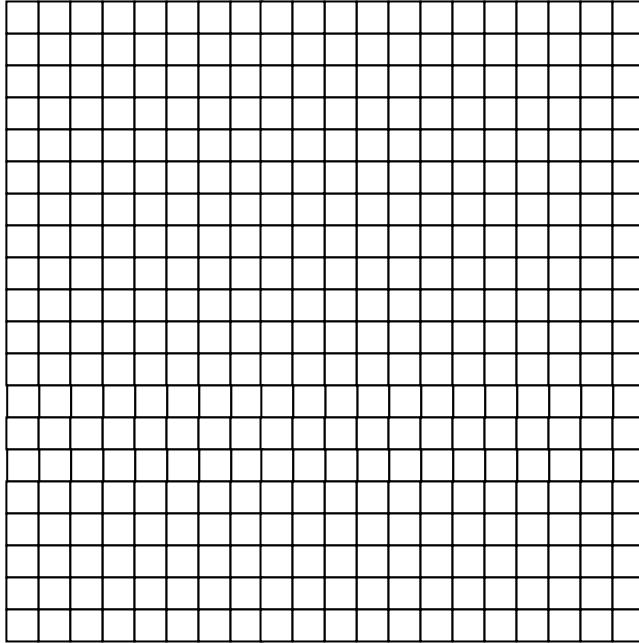
15) Parent Function: $y = a^x$

a) $y = 5^x$

b) $y = 2^x$

c) $y = \left(\frac{1}{2}\right)^x$
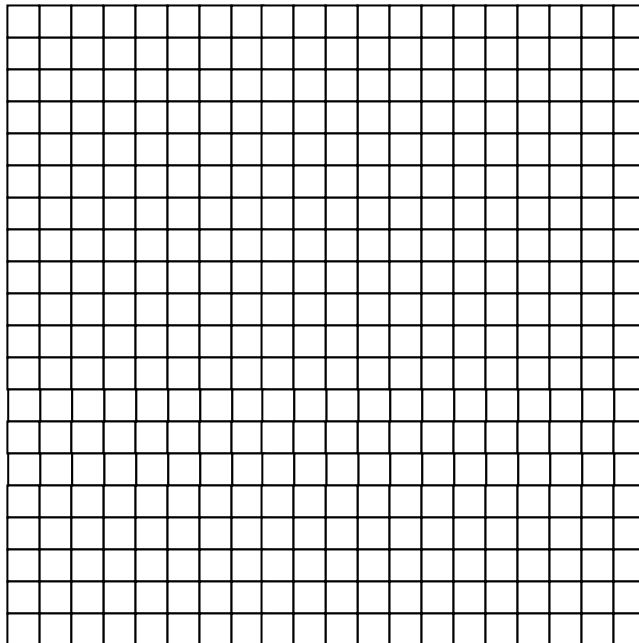
d) $y = \left(\frac{1}{4}\right)^x$

16) Parent Function: $y = \dfrac{1}{x}$

a) $y = \dfrac{1}{(x-2)}$

b) $y = -\dfrac{1}{x}$

c) $y = \dfrac{1}{(x+4)}$

d) $y = \dfrac{2}{(5-x)}$
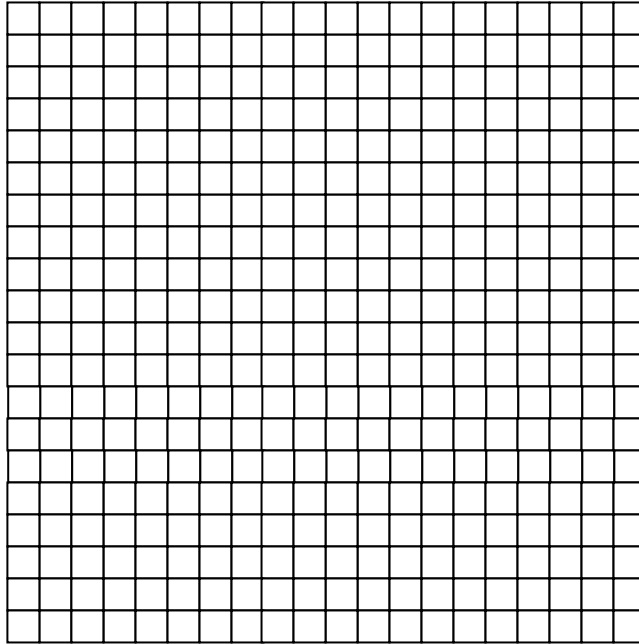
17) Parent Function: $y = [x]$ or $y = \text{int } x$

Note: $[x]$ or int $x$ is the Integer Part of x. It is found in the MATH menu, NUM submenu, #5

a) $y = [x] + 2$ 
b) $y = [x-3]$ 
c) $y = [3x]$ 
d) $y = 3 - [x]$

18) Resize your viewing window to $[0,1] \times [0,1]$. Graph all of the following functions in the same window. List the functions from the highest graph to the lowest graph. How do they compare for values of $x > 1$?

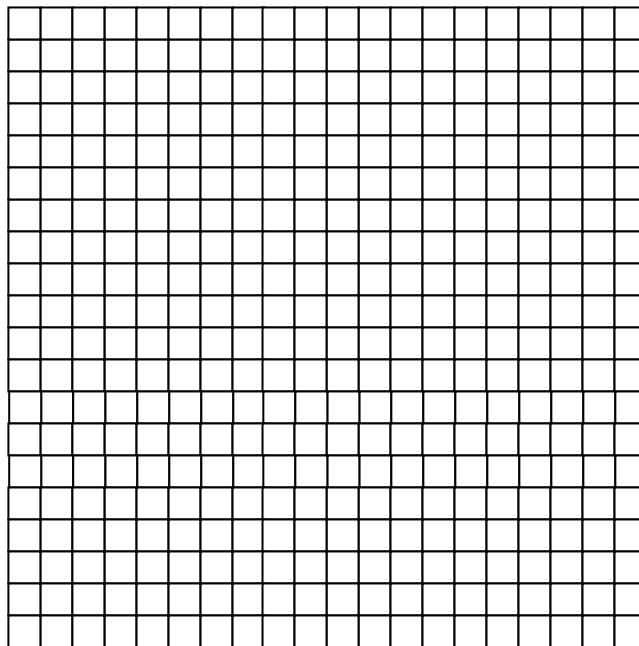a) $y = x^2$ 
b) $y = x^3$ 
c) $y = \sqrt{x}$ 
d) $y = x^{2/3}$

e) $y = |x|$ 
f) $y = x^4$ 
g) $y = \sqrt[4]{x}$ 
h) $y = x^{3/2}$

19) Given: $f(x) = x^4 - 3x^3 + 2x^2 - 7x - 11$

Find all roots to the nearest 0.001

20) Given: $f(x) = 3\sin(2x) - 4x + 1$ from $[-2\pi, 2\pi]$

Find all roots to the nearest 0.001

Note: All trig functions are done in radian mode.

21) Given: $f(x) = 0.7x^2 + 3.2x + 1.5$

Find all roots to the nearest 0.001

22) Given: $f(x) = x^4 - 8x^2 + 5$

Find all roots to the nearest 0.001

23) Given: $f(x) = x^3 + 3x^2 - 10x - 1$

Find all roots to the nearest 0.001

24) Given: $f(x) = 100x^3 - 203x^2 + 103x - 1$

Find all roots to the nearest 0.001

25) Given: $f(x) = |x - 3| + |x| - 6$

Find all roots to the nearest 0.001

26) Given: $f(x) = |x| - |x - 6| = 0$

Find all roots to the nearest 0.001

Solve the following inequalities without a calculator. Then check your answers with the calculator.
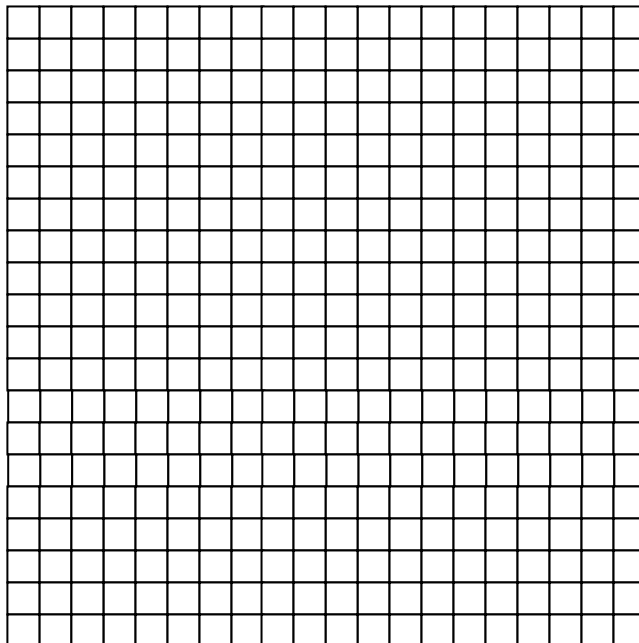
27) $x^2 - x - 6 > 0$

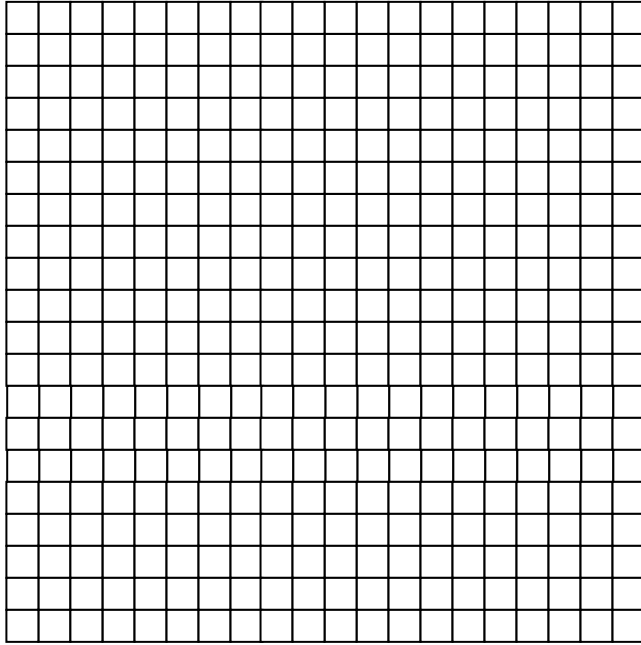28) $x^2 - 2x - 5 \geq 3$

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

For each of the following problems 30-33

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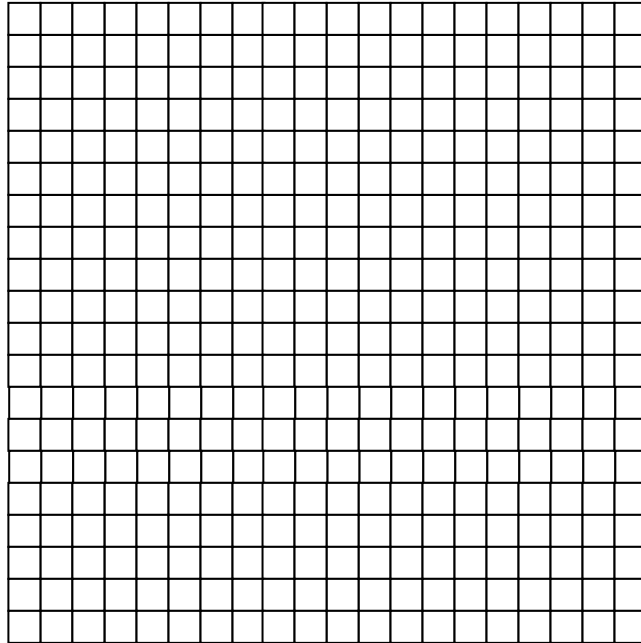
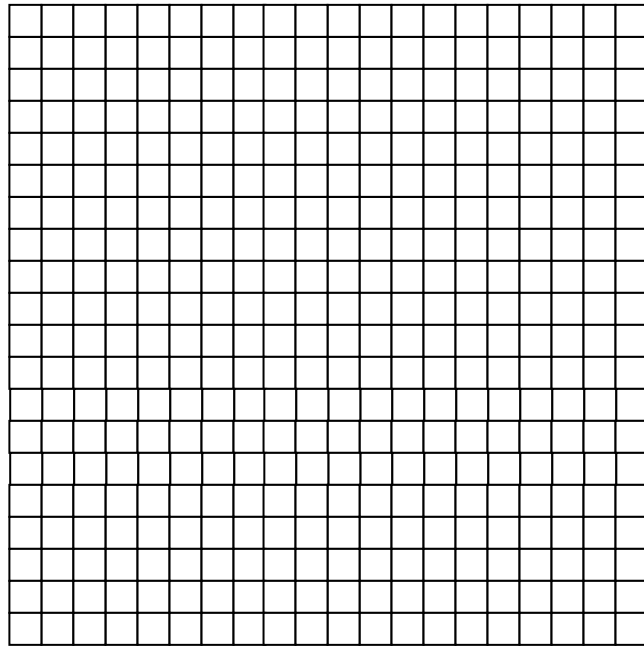      e)      Sketch the graph of $2f(x)$

30) $f(x) = 2x + 3$
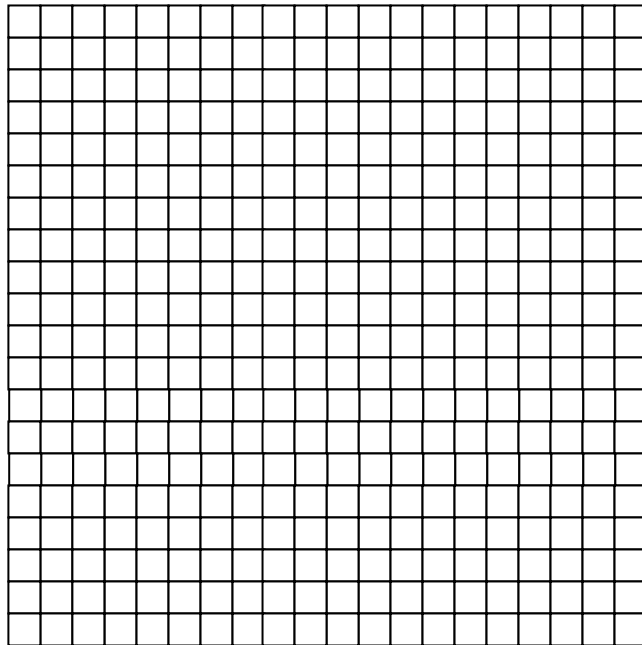
31)  $f(x) = x^2 - 5x - 3$

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

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

34)  Let $f(x) = \sin x$

Let $g(x) = \cos x$

a)  Sketch the graph of $f^2$

b)  Sketch the graph of $g^2$

c)  Sketch the graph of $f^2 + g^2$

35) Given: $f(x) = 3x + 2$

   $g(x) = -4x - 2$

   Find the point of intersection.

36) Given: $f(x) = x^2 - 5x + 2$

   $g(x) = 3 - 2x$

   Find the points of any intersection.

37) How many times does the graph of $y = 0.1x$ intersect the graph of $y = \sin(2x)$?

38) Given: $f(x) = x^4 - 7x^3 + 6x^2 + 8x + 9$

   a)     Determine the $x$- and $y$-coordinates of the lowest point on the graph.

   b)     Size the $x$-window from [-10,10]. Find the highest and lowest values of $f(x)$ over the interval [-10,10]

   c)     Find the highest and lowest values of $f(x)$ if $-2 \le x \le 6$

   d)     Suppose the range is from 10 to 30 in Quadrant II. Determine the $x$-coordinates (domain) of the function that will cover the range.