



# SOUTHINGTON HIGH SCHOOL

**Richard Aroian, Principal**

Assistant Principals: Leah Clark, Simone Crouch, Thomas Hinman, Kathleen Reynolds

Dear Students,

Attached to this letter you will find a comprehensive set of problems that reflect critical math skills that should be mastered prior to entering your Calculus class at Southington High School. You are encouraged to utilize a wide range of methods for finding the correct answer, including techniques both with and without the aid of a calculator\*. Working with a friend, sibling, or parent might be a helpful way to complete this assignment! Also watching videos on Khan Academy is encouraged. You can access Khan Academy by going to <https://www.khanacademy.org/>

On the first or second day of the course your teachers will check your packets for completion and review how to solve some of the problems that are most important to beginning your first unit of the year. To receive full credit for completing the assignment you must attempt each problem and show all work used to complete it. Soon thereafter, you will be given a brief assessment on these skills to measure your progress and readiness for the course. Please note: the work and answers to the odd questions are in this packet. They are provided as a means to assess your work as you go.

Our goal is for you to have a successful and enjoyable transition into your Calculus class at Southington High School and this packet is meant to help facilitate this process. Our absolute hope is that you try your best and remember that your teachers are prepared to help you with any challenges you faced when you return in late August.

Sincerely,

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\*Reminder: A calculator is an important tool used within this course. Students are strongly encouraged to obtain one for their personal use. Copies of this packet may be found on the Southington High School Website. Go to [www.southingtonschools.org](http://www.southingtonschools.org) and click on the link to Parent Resources



**Be sure to round all answers to 3 decimal places.**

**Part I:** Find the equation of each line in slope intercept form passing through (-1,4) and having the following characteristics:

- 1. Passing through the point (-4,-7)
- 2. Perpendicular to  $2x - 3y = 5$
- 3. With an undefined slope.
- 4. Parallel to the x-axis.

**Part II:** The velocity of sound in dry air increases as the temperature increases. At  $40^{\circ}\text{C}$ , sound travels at a rate of about 355 meters per second. At  $49^{\circ}\text{C}$  it travels at a rate of about 360 meters per second.

5. Write a linear equation, in slope intercept form, for the velocity  $v$ , of sound as a function of the temperature,  $T$ .

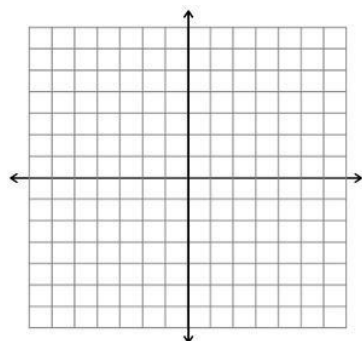
6. Use this equation to find the velocity of sound at  $60^{\circ}\text{C}$ .

**Part III:**

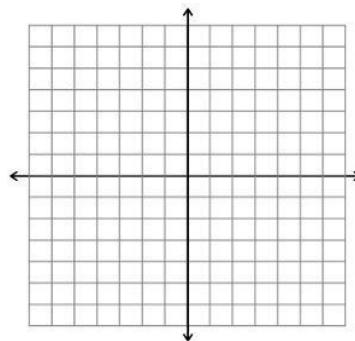
7. In 1998, the product was worth \$20,600. The value is expected to decrease in value by \$1,500 per year during the next 5 years. Use this information to write a linear equation that gives the dollar value  $V$ , of the product in terms of the year,  $t$ . ( Let  $t = 8$  represents 1998)

**Part IV:** Graph the following lines.

8.  $x + 2y + 6 = 0$



9.  $x = 4$



**Part V:** An employee has two options for positions in a large corporation. One position pays \$12.50 plus an additional unit rate of \$0.75/ unit produced. The other pays \$9.20 plus a unit rate of \$1.30/ unit produced.

10. Find the linear equations for hourly wages  $W$ , in terms of  $x$ , the number of units produced per hr., for each option.

11. Algebraically, find the point of intersection.

12. Interpret the meaning of the point of intersection. How would you use this information to select the correct option, if the goal were to obtain the highest hourly wage?

**Part VI:** Solve graphically, draw a rough sketch of the graph and give the solution(s). **(Use graphing calculator)**

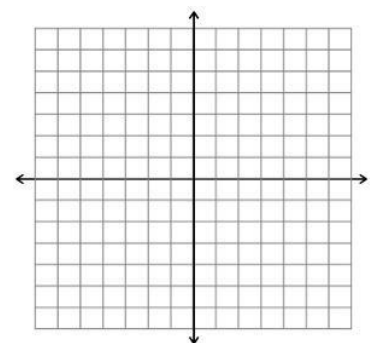
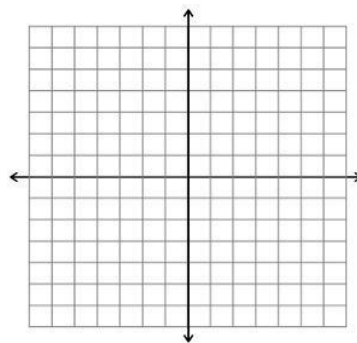
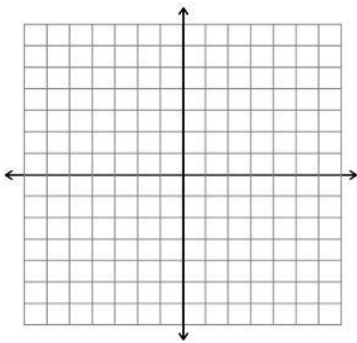
13.  $2x = \sqrt{15 - 4x}$

14.  $y = 5 - 2x$

15.  $y = .77x^2 - 1.32x - 9.31$

$y = x^3 - 3$

$y = 500$



**Part VII:** Evaluate  $f(x) = -2x^2 - 5x - 7$  when:

16.  $f(-4) =$

17.  $f(2x-1) =$

18.  $f(2c) =$

19.  $\frac{f(x+h) - f(x)}{h} =$

**Part VIII:** Solve for y. Determine whether y is a function of x.

20.  $x^2 + y^2 = 4$

21.  $x^2y - x^2 + 4y = 0$

**Part IX:** Given A(-2,1) and B(3,-4)

22. Find the distance between A and B.

23. Find the midpoint of segment AB.

**Part X:** Simplify

24.  $\ln e^4 =$

25.  $\ln 1 =$

**Part XI:** Rewrite the following:

26.  $8 = \ln(X+3)$  in exponential form

27.  $e^x = 9$  in log form

**Part XII:** Find each of the following in simplest radical form.

28.  $\cos(7\pi/6) =$

29.  $\csc(-3\pi/4) =$

30.  $\tan(-7\pi) =$

**Part XIII:** Find  $\vartheta$ ,  $0 \leq \vartheta < 2\pi$ .

31.  $\sin \vartheta = \frac{1}{2}$

32.  $\cot \vartheta = -1$

33.  $\cos(3\vartheta) = \frac{1}{2}$

**Part XIV:** Find the Domain of each.

34.  $y = \sqrt[3]{3x - 2}$

35.  $y = -4x^3 - 5x - 2$

36.  $y = \frac{2x-5}{\sqrt{7-x}}$

37.  $y = \ln(2x - 3)$

**Part XV:** Solve algebraically.

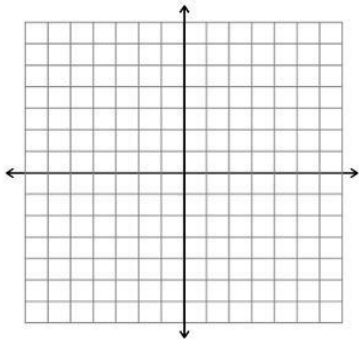
38.  $14e^{3x+2} = 560$

39.  $4\ln 3x = 15$

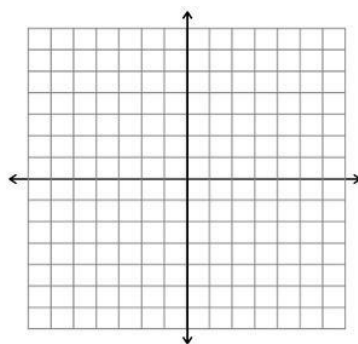
40.  $\ln(X+5) - \ln x = 2$

**Part XVI:** Draw the graph of each of the following: (n is any positive integer) **NO Calculator**

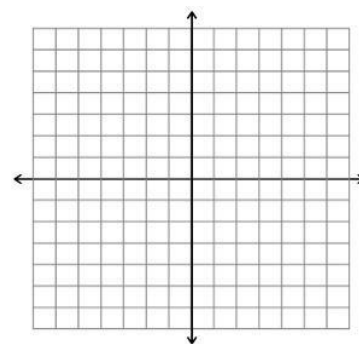
41.  $y = -x^2 + 4$



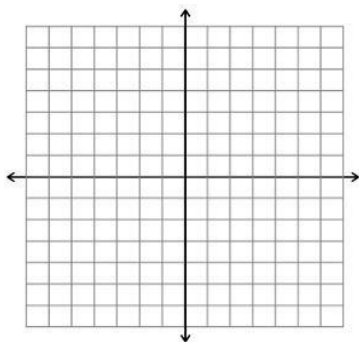
42.  $y = x^3 + 1$



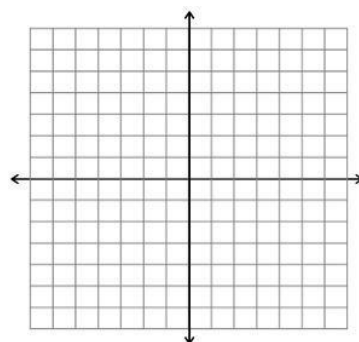
43.  $y^2 + 3 = x$



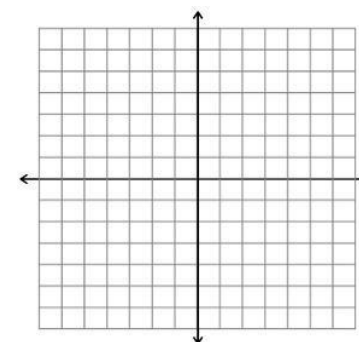
44.  $y = \sqrt{x + 3}$



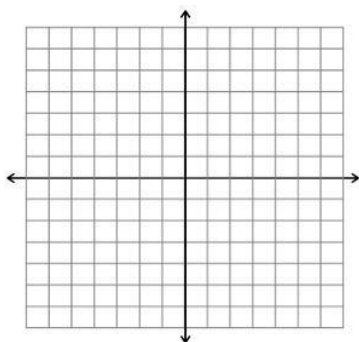
45.  $y = \sqrt[3]{x + 3}$



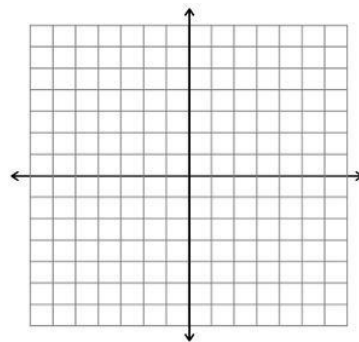
46.  $y = |x + 3|$



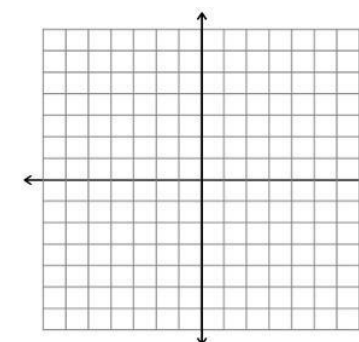
47.  $y = e^x$



48.  $y = \ln x$



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



**Part XVII:** Find the x and y intercepts algebraically.

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

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

52.  $y = \frac{x^2 + 3x}{(3x + 1)^2}$

**Part XVIII:** Find each of the following, if  $f(x) = 3x - 4$ ;  $g(x) = x^2 - 5$ ;  $h(x) = \sqrt{5x + 2}$

53.  $f \circ g(x)$

54.  $g \circ f(x)$

55.  $f(g(-3))$

56.  $g(h(-4))$

57.  $f^{-1}(x)$

58.  $h^{-1}(x)$

**Part XIX:** Graph  $f(x) = \frac{4x-2}{x+2}$

59. Domain:

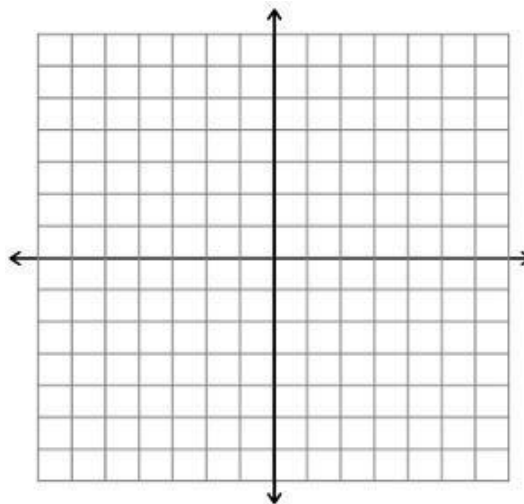
60. Range:

61. Vertical Asymptote:

62. Horizontal Asymptote:

63. Roots:

64. y-intercept:



**Part XX:** Solve for  $x$ ,  $0 \leq x < 2\pi$ .

65.  $2\sin^2 x + 3\sin x = -1$

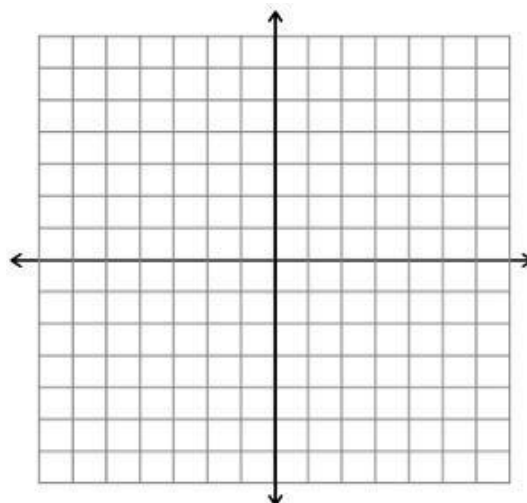
66.  $\csc^2 x - 2 = 0$

67.  $\sin^2 x + \cos x = -1$

**Part XXI:** 68. Graph  $g(x) = \begin{cases} x - 6, & x < 2 \\ x^2 + 2, & x \geq 2 \end{cases}$

69.  $g(-1) =$

70.  $g(2) =$



**Answer Key**

1.  $y = \frac{11}{3}x + \frac{23}{3}$

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

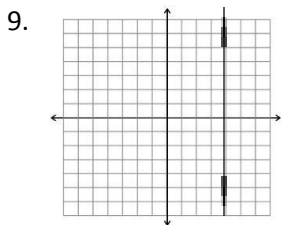
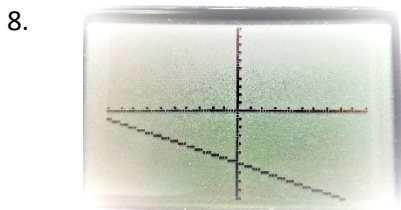
3.  $x = -1$

4.  $y = 4$

5.  $y = \frac{5}{9}x + \frac{2995}{9}$

6. 366.11 m/sec.

7.  $V = -1500x + 32,600$



10.  $W = 12.50 + .75x$

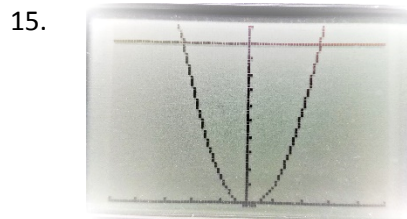
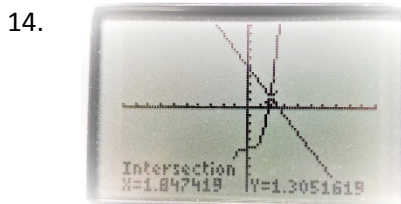
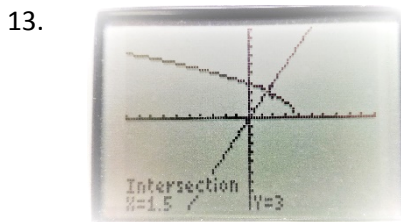
$W = 9.20 + 1.30x$

11. (6,17)

12. Wage = \$17

First option if under 6 units

Second option if over 6 units



16. -19

17.  $-8x^2 - 2x - 4$

18.  $-8c^2 - 10c - 7$

19.  $-4x - 5$

20.  $y = \pm \sqrt{4 - x^2}$ ; No

21.  $y = \frac{x^2}{x^2 + 4}$ ; Yes

22.  $\sqrt{34}$

23.  $(\frac{1}{2}, \frac{5}{2})$

24. 4

25. 0

26.  $x = e^8 - 3$

27.  $x = \ln 9$

28.  $-\frac{\sqrt{3}}{2}$

29.  $-\sqrt{2}$

30. 0

31.  $\frac{\pi}{6}$  or  $\frac{5\pi}{6}$

32.  $\frac{3\pi}{4}$  or  $\frac{7\pi}{4}$

33.  $\frac{\pi}{9}$  or  $\frac{5\pi}{9}$

34. All Reals

35. All Reals

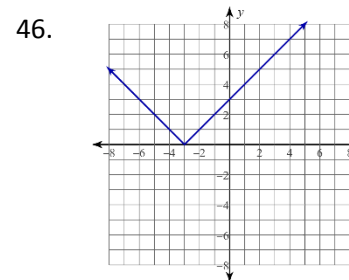
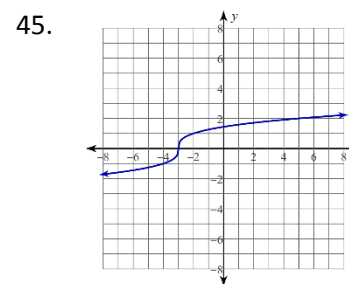
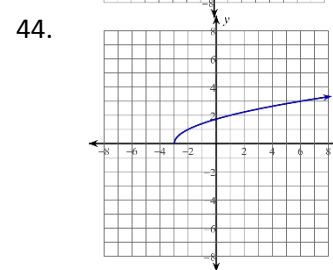
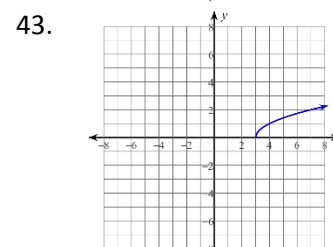
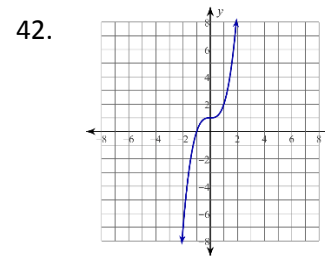
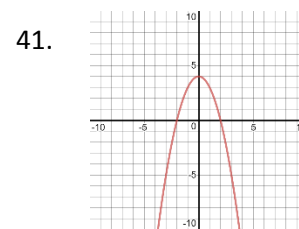
36.  $x \leq 7$

37.  $x > \frac{3}{2}$

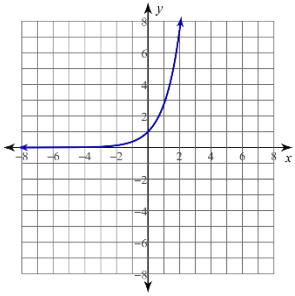
38.  $x = \frac{\ln \ln 40 - 2}{3}$

39.  $\frac{1}{3}e^{\frac{15}{4}}$

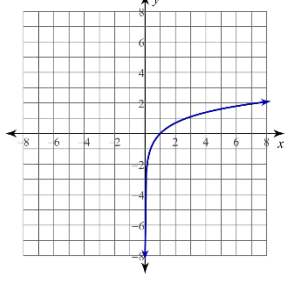
40.  $x = \frac{-5}{1 - e^2}$



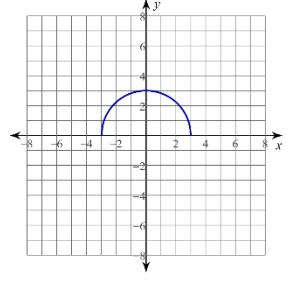
47.



48.



49.



50. (-2,0) & (1,0)

(0,-2)

51. (0,0) & (3,0) & (-3,0)

(0,0)

52. (-3,0) & (0,0)

(0,0)

53.  $3x^2 - 19$

54.  $9x^2 - 24x + 11$

55. 8

56. -23

57.  $\frac{x+4}{3}$

58.  $\frac{x^2-2}{5}$

59.  $(-\infty, -2) \cup (-2, \infty)$

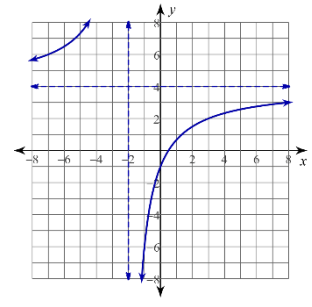
60.  $(-\infty, 4) \cup (4, \infty)$

61.  $x = -2$

62.  $y = 4$

63.  $(\frac{1}{2}, 0)$

64. (0,1)

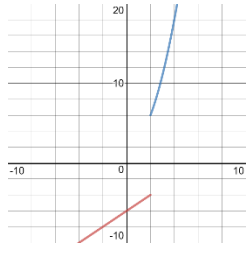


65.  $x = \frac{3\pi}{2}$

66.  $x = \frac{\pi}{4}, \frac{3\pi}{4}$

67.  $x = \pi$

68.



69. -7

70. 6