

# POSNACK

S C H O O L

## Caluclus Honors Summer Assignment

Dear Parents/Students,

In the summertime, many necessary mathematical skills are lost due to the absence of daily exposure. The loss of skills may result in a lack of success and unnecessary frustration for students as they begin the new school year. The purpose of this math assignment is to set the stage for instruction for the new school year. Packets can be printed out or can be printed to OneNote. The completed packet is due on the first day of school during math class and will be worth 30 homework points. The packet is a review of previously taught concepts. If needed, additional help can be found at [www.khanacademy.org](http://www.khanacademy.org). These skills are required to be successful in the upcoming year.

Thank you,

Fischer High School Math Team

## Calculus Honors summer packet

Complete all work on paper. Show all work. If work is not shown, full credit may not be given.  
Do not use a calculator unless directions explicitly instruct.

In exercises 1-10, sketch the equation:

1.  $y = \frac{1}{2}x + 2$
2.  $y = 5 - 2x$
3.  $y = 4 - x^2$
4.  $y = (x - 3)^2$
5.  $y = |x + 2|$
6.  $y = |x| - 1$
7.  $y = \sqrt{x} - 6$
8.  $y = \sqrt{x + 2}$
9.  $y = \frac{3}{x}$
10.  $y = \frac{1}{x+2}$

In exercises 11-20, find any intercepts:

11.  $y = 2x - 5$
12.  $y = 4x^2 + 3$
13.  $y = x^2 + x - 2$
14.  $y^2 = x^3 - 4x$
15.  $y = x\sqrt{16 - x^2}$
16.  $y = (x - 1)\sqrt{x^2 + 1}$
17.  $y = \frac{2 - \sqrt{x}}{5x + 1}$
18.  $y = \frac{x^2 + 3x}{(3x + 1)^2}$
19.  $x^2y - x^2 + 4y = 0$
20.  $y = 2x - \sqrt{x^2 + 1}$

In exercises 21-32, test for symmetry with respect to each axis and to the origin:

21.  $y = x^2 - 6$
22.  $y = x^2 - x$
23.  $y^2 = x^3 - 8x$
24.  $y = x^3 + x$
25.  $xy = 4$
26.  $xy^2 = -10$
27.  $y = 4 - \sqrt{x + 3}$

$$28. xy - \sqrt{4 - x^2} = 0$$

$$29. y = \frac{x}{x^2 + 1}$$

$$30. y = \frac{x^2}{x^2 + 1}$$

$$31. y = |x^3 + x|$$

$$32. |y| - x = 3$$

In exercises 33-50, find any intercepts and test for symmetry. Then sketch the graph of the equation:

$$33. y = 2 - 3x$$

$$34. y = \frac{2}{3}x + 1$$

$$35. y = 9 - x^2$$

$$36. y = 2x^2 + x$$

$$37. y = x^3 + 2$$

$$38. y = x^3 - 4x$$

$$39. y = x\sqrt{x + 5}$$

$$40. y = \sqrt{25 - x^2}$$

$$41. x = y^3$$

$$42. x = y^2 - 4$$

$$43. y = \frac{8}{x}$$

$$44. y = \frac{10}{x^2 + 1}$$

$$45. y = 6 - |x|$$

$$46. y = |6 - x|$$

$$47. y^2 - x = 9$$

$$48. x^2 + 4y^2 = 4$$

$$49. x + 3y^2 = 6$$

$$50. 3x - 4y^2 = 8$$

In exercises 51-56, find the points of intersection of the graphs of the equations:

$$51. x + y = 8 \text{ and } 4x - y = 7$$

$$52. 3x - 2y = -4 \text{ and } 4x + 2y = -10$$

$$53. x^2 + y = 6 \text{ and } x + y = 4$$

$$54. x = 3 - y^2 \text{ and } y = x - 1$$

$$55. x^2 + y^2 = 5 \text{ and } x - y = 1$$

$$56. x^2 + y^2 = 25 \text{ and } -3x + 5 = 15$$

In exercises 57-60, use a calculator to find the points of intersection of the graphs. Then check your results analytically:

57.  $y = x^3 - 2x^2 + x - 1$  and  $y = -x^2 + 3x - 1$

58.  $y = x^4 - 2x^2 + 1$  and  $y = 1 - x^2$

59.  $y = \sqrt{x + 6}$  and  $\sqrt{-x^2 - 4x}$

60.  $y = -|2x - 3| + 6$  and  $y = 6 - x$

In exercises 61-66, find the slope of the line passing through the pair of points:

61.  $(3, -4), (5, 2)$

62.  $(1, 1), (-2, 7)$

63.  $(4, 6), (4, 1)$

64.  $(3, -5), (5, -5)$

65.  $\left(-\frac{1}{2}, \frac{2}{3}\right), \left(-\frac{3}{4}, \frac{1}{6}\right)$

66.  $\left(\frac{7}{8}, \frac{3}{4}\right), \left(\frac{5}{4}, -\frac{1}{4}\right)$

In exercises 67-72, find an equation of the line that passes through the point and has the indicated slope:

67. Point:  $(0, 3)$  Slope:  $m = \frac{3}{4}$

68. Point:  $(-5, -2)$  Slope:  $m = \frac{2}{3}$

69. Point:  $(0, 0)$  Slope:  $m$  is undefined

70. Point:  $(0, 4)$  Slope:  $m = 0$

71. Point:  $(3, -2)$  Slope:  $m = 3$

72. Point:  $(-2, 4)$  Slope:  $m = -\frac{3}{5}$

In exercises 73-78, find the slope and the  $y$ -intercept (if possible) of the line:

73.  $y = 4x - 3$

74.  $-x + y = 1$

75.  $x + 5y = 20$

76.  $6x - 5y = 15$

77.  $x = 4$

78.  $y = -1$

In exercises 79-86, find an equation of the line that passes through the pair of points:

79.  $(0, 0), (4, 8)$

80.  $(-2, 2), (1, 7)$

- 81.  $(2,8), (5,0)$
- 82.  $(-3,6), (1,2)$
- 83.  $(6,3), (6,8)$
- 84.  $(1, -2), (3, -2)$
- 85.  $\left(\frac{1}{2}, \frac{7}{2}\right), \left(0, \frac{3}{4}\right)$
- 86.  $\left(\frac{7}{8}, \frac{3}{4}\right), \left(\frac{5}{4}, -\frac{1}{4}\right)$

In exercises 87-94, write the general forms of the equations of the lines through the point (a) parallel to the given line and (b) perpendicular to the given line:

- 87. Point:  $(-7, -2)$  Line:  $x = 1$
- 88. Point:  $(-1,0)$  Line:  $y = -3$
- 89. Point:  $(2,5)$  Line:  $x - y = -2$
- 90. Point:  $(-3,2)$  Line:  $x + y = 7$
- 91. Point:  $(2,1)$  Line:  $4x - 2y = 3$
- 92. Point:  $\left(\frac{5}{6}, -\frac{1}{2}\right)$  Line:  $7x + 4y = 8$
- 93. Point:  $\left(\frac{3}{4}, \frac{7}{8}\right)$  Line:  $5x - 3y = 0$
- 94. Point:  $(4, -5)$  Line:  $3x + 4y = 7$

In exercises 95-100, evaluate the function at the given value(s) of the independent variable. Simply the results:

- 95.  $f(x) = 7x - 4$ 
  - a.  $f(0)$
  - b.  $f(-3)$
  - c.  $f(b)$
  - d.  $f(x - 1)$
  
- 96.  $f(x) = \sqrt{x + 5}$ 
  - a.  $f(-4)$
  - b.  $f(11)$
  - c.  $f(4)$
  - d.  $f(x + \Delta x)$
  
- 97.  $g(x) = 5 - x^2$ 
  - a.  $g(0)$
  - b.  $g(\sqrt{5})$
  - c.  $g(-2)$
  - d.  $g(t - 1)$

98.  $g(x) = x^2(x - 4)$

- a.  $g(4)$
- b.  $g\left(\frac{3}{2}\right)$
- c.  $g(c)$
- d.  $g(t + 4)$

99.  $f(x) = \cos 2x$

- a.  $f(0)$
- b.  $f\left(-\frac{\pi}{4}\right)$
- c.  $f\left(\frac{\pi}{3}\right)$
- d.  $f(\pi)$

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

- a.  $f(\pi)$
- b.  $f\left(\frac{5\pi}{4}\right)$
- c.  $f\left(\frac{2\pi}{3}\right)$
- d.  $f\left(-\frac{\pi}{6}\right)$

In exercises 101-108, find the domain and range of the function:

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

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

103.  $g(x) = \sqrt{6x}$

104.  $h(x) = -\sqrt{x + 3}$

105.  $f(x) = |x - 3|$

106.  $f(t) = \sec \frac{\pi t}{4}$

107.  $h(t) = \cot t$

108.  $f(x) = \frac{x-2}{x+4}$

In exercises 109-114, find the domain of the function:

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

110.  $f(x) = \sqrt{x^2 - 3x + 2}$

111.  $g(x) = \frac{2}{1 - \cos x}$

112.  $h(x) = \frac{1}{\sin x - \left(\frac{1}{2}\right)}$

113.  $f(x) = \frac{1}{|x+3|}$

114.  $g(x) = \frac{1}{|x^2-4|}$

In exercises 115-118, evaluate the function as indicated:

115.  $\begin{cases} 2x + 1, x < 0 \\ 2x + 2, x \geq 0 \end{cases}$

- a.  $f(-1)$
- b.  $f(0)$
- c.  $f(2)$
- d.  $f(t^2 + 1)$

116.  $\begin{cases} x^2 + 2, x \leq 1 \\ 2x^2 + 2, x > 1 \end{cases}$

- a.  $f(-2)$
- b.  $f(0)$
- c.  $f(1)$
- d.  $f(s^2 + 2)$

117.  $\begin{cases} |x| + 1, x < 1 \\ -x + 1, x \geq 1 \end{cases}$

- a.  $f(-3)$
- b.  $f(1)$
- c.  $f(3)$
- d.  $f(b^2 + 1)$

118.  $\begin{cases} \sqrt{x+4}, x \leq 5 \\ (x-5)^2, x > 5 \end{cases}$

- a.  $f(-3)$
- b.  $f(0)$
- c.  $f(5)$
- d.  $f(10)$

In exercises 119-122, sketch the graph of the function and determine its domain and range:

119.  $f(x) = \frac{4}{x}$

120.  $f(x) = \frac{1}{4}x^3 + 3$

121.  $f(x) = x + \sqrt{4 - x^2}$

122.  $g(t) = 3 \sin \pi t$

123. Given  $f(x) = \sqrt{x}$  and  $g(x) = x^2 - 1$ , evaluate each expression:

- a.  $f(g(1))$
- b.  $g(f(1))$
- c.  $g(f(0))$
- d.  $f(g(-4))$
- e.  $f(g(x))$
- f.  $g(f(x))$

124. Given  $f(x) = \sin x$  and  $g(x) = \pi x$ , evaluate each expression:

- a.  $f(g(2))$
- b.  $g\left(f\left(\frac{1}{2}\right)\right)$
- c.  $g(f(0))$
- d.  $g\left(f\left(\frac{\pi}{4}\right)\right)$
- e.  $f(g(x))$
- f.  $g(f(x))$