

## AP Calculus & Calculus Assignment

Problems with an \* after the number do not need to be completed by those going into Level 1 Calculus.

### Instructions:

- Make sure all problems are numbered in order. (Level 1: If the problem had an \*please skip that number)
- All work is in pencil, and is shown completely.
- Graphs are drawn out by hand.
- If you use your calculator for some steps, intermediate work should be shown. There are no problems here that should be done solely on the calculator.
- Assignment is to be handed in on the first day of school, regardless of whether or not you have class. You will receive only ½ credit if the assignment is handed in a day late. If it is more than two days late you will receive no credit.
- There will be a test covering this material on the second day class meets. No calculators will be allowed for this test, for AP students.
- You are responsible for knowing all the material covered by this assignment as it is a review of past courses. If you do happen to have any questions on the assigned material, I will be available at school the two days before classes start. You will not have time to ask questions on the day the assignment is due.

### Other information you should know:

- ❖ Calculus is performed in radians only. Therefore you should know the unit circle in radians. A copy is attached for review.
  - ❖ A list of trigonometric identities is also attached, these should also be known, as we use substitutions to perform some problems.
  - ❖ You should be comfortable solving equations of various forms: linear, quadratic, polynomial, rational, radical, exponential or trigonometric. (Quadratics you should be comfortable solving by factoring and the quadratic formula)
  - ❖ You should be able to graph the following, and identify important points (origin, zeros, intercepts, period, asymptotes) without a calculator.
    - $y = \sin x$
    - $y = \cos x$
    - $y = \tan x$
    - all lines
    - $y = \ln x$
    - $y = \log x$
    - $y = e^x$
    - $y = a^x$
    - $y = \sqrt{x}$
    - $y = x^2$
    - $y = x^3$
    - piecewise functions
    - $y = |x|$
- You should also have an understanding of the transformations that can be applied along with their resulting effects on parent function (i.e.  $y = af(b(x+h)) - k$ )
- ❖ On your calculator you should be able to find max/min, zeros, and intersections, along with graphing parametrically, editing/inputting lists, graph using STAT PLOT, understand the different zoom features, and VARS button

In exercises 1-4, let L be the line determined by points A and B. (a) Plot A and B. (b) Find the slope of L. (c) Draw the graph of L.

1.  $A(1,-2), B(2,1)$       2.  $A(-2,-1), B(1,-2)$       3.  $A(2,3), B(-1,3)$       4.  $A(1,2), B(1,-3)$

In exercises 5-8, write an equation for (a) the vertical line and (b) the horizontal line through the point P.

5.  $P(2,3)$       6.  $P\left(-1, \frac{4}{3}\right)$       7.  $P(0, -\sqrt{2})$       8.  $P(-\pi, 0)$

In exercises 9-12, write a general linear equation for the line through the two points.

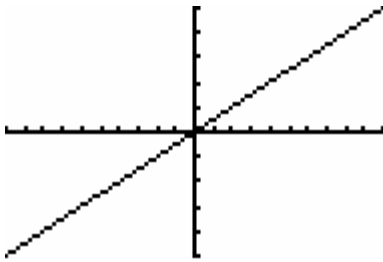
9.  $(0,0), (2,3)$       10.  $(1,1), (2,1)$       11.  $(-2,0), (-2,-2)$       12.  $(-2,1), (2,-2)$

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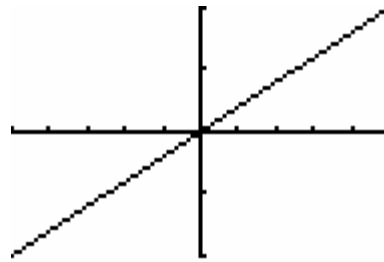
In exercises 13-14, the line contains the origin and the point in the upper right corner of the graph. Write an equation for the line.

13.



$[-10,10]$  by  $[-25,25]$

14.



$[-5,5]$  by  $[-2,2]$

In exercises 15-18, find the (a) slope and (b) y-intercept, and (c) graph the line.

15.  $3x + 4y = 12$

16.  $x + y = 2$

17.  $x/3 + y/4 = 1$

18.  $y = 2x + 4$

In exercises 19-22, write an equation for the line through P that is parallel to L, (b) perpendicular to L.

19.  $P(0,0), L: y = -x + 2$

21.  $P(-2,4), L: x = 5$

20.  $P(-2,2), L: 2x + y = 4$

22.  $P(-1,1/2), L: y = 3$

In exercise 23-24, find the value of x or y for which the line through A and B has the given slope m.

23.  $A(-2,3), B(4, y), m = -2/3$

24.  $A(-2,3), B(4, y), m = -2/3$

In exercises 25-34: (a) Find the domain. (b) Find the range. (c) Draw its graph. (d) Determine any symmetries that are characteristics of the graph.

25.  $y = 4 - x^2$

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

33.  $y = x^{2/3} *$

26.  $y = x^2 - 9$

30.  $y = (1 - x^2)^{1/3} *$

34.  $y = 1 + 1/x^2 *$

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

31.  $y = 1 + 1/x *$

28.  $y = -\sqrt{-x}$

32.  $y = \sqrt{4 - x^2} *$

In exercises 35-40, determine whether the function is even, odd or neither.

35.  $y = x$

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

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

36.  $y = x + 2$

37.  $y = x + x^3$

39.  $y = \frac{1}{x-1} *$

For problems 41-44, (a) draw the graph of the function. Then find its (b) domain and (c) range.

41.  $f(x) = -|3 - x| + 2$

43.  $f(x) = \begin{cases} 1, & x < 0 \\ \sqrt{x}, & x \geq 0 \end{cases}$

44.  $f(x) = \begin{cases} 4 - x^2, & x < 1 \\ (3/2)x + 3/2, & 1 \leq x \leq 3 \\ x + 3, & x > 3 \end{cases} *$

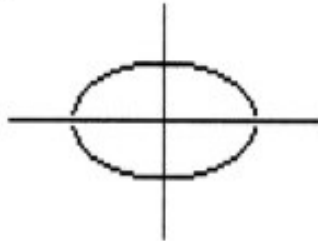
42.  $f(x) = \begin{cases} 3 - x, & x \leq 1 \\ 2x, & 1 < x \end{cases}$

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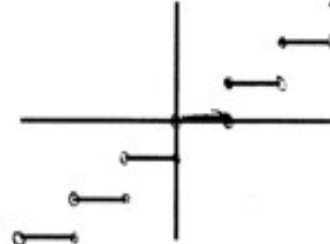
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For problems 45-48, use the vertical line test to determine whether the curve is the graph of a function.

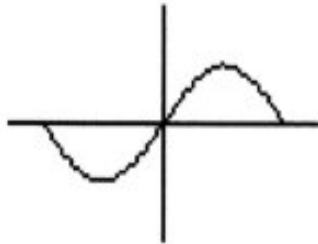
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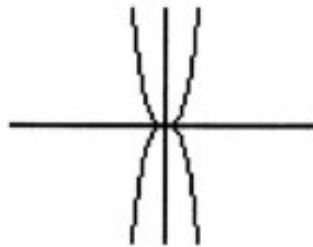
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46.

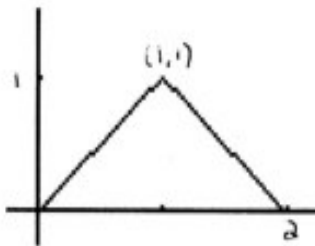


48.

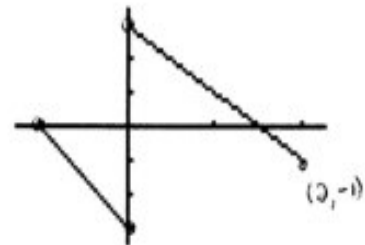


In exercises 49-52, write the piecewise formula for the function.

49.



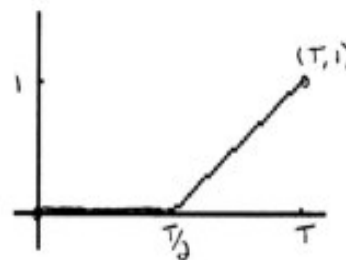
51.



50.



52. \*



In exercises 53-54, find:

(a)  $f(g(x))$ , (b)  $g(f(x))$ , (c)  $f(g(0))$ , (d)  $g(f(0))$ , (e)  $g(g(-2))$ , (f)  $f(f(x))$

53.  $f(x) = x + 5, g(x) = x^2 - 3$

54.  $f(x) = x + 1, g(x) = x - 1$

In exercises 55-56, graph the function. State its domain, range, and intercepts.

55.  $y = -2^x + 3$

56.  $y = 3e^{-x} - 2$

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In exercises 57-58, solve the equations. The problems with a # are the only ones that you should have to use your calculator for.

57.  $e^x = 4$  #

58.  $3 - 2^{-x} = 0$  #

59.  $\log_3 x = 6$

60.  $\ln(x^2 + 3x) - \ln 10 = 0$  #

61.  $5x^3 + 14x^2 - 7x - 12 = 0$  (rational root theorem)

62.  $3x^3 - 6x^2 - 24x = 0$  (factor)

63.  $125x^3 - 27 = 0$  (factor)

64.  $9 + \sqrt{4x+8} = 11$

65.  $2(7x-1)^{1/3} - 4 = 0$

66.  $\sqrt{x-6} = 3 + \sqrt{x}$

67.  $4x + x(x-3) = 0$

68.  $(2x-3)^2 + 17x = 15$

69.  $\begin{cases} x+2y=2 \\ 5x-3y=-29 \end{cases}$

70.  $\frac{3}{y-2} + \frac{2y}{4-y^2} = \frac{5}{y+2}$

In exercises 59-61, find  $f^{-1}$ , and verify that  $f^{-1}(f(x)) = f(f^{-1}(x)) = x$ .

71.  $f(x) = 2x + 3$

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

73.  $f(x) = -(x-2)^2, x \geq 1$  \*

In exercises 62-63, draw the graph and determine the domain and range of the function.

74.  $y = 2\ln(3-x) - 4$

75.  $y = -3\log(x+2) + 1$

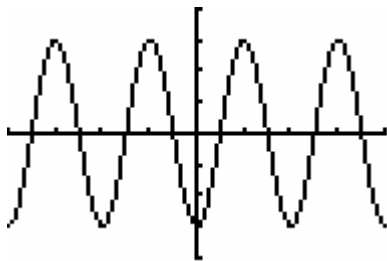
In exercises 64-65, solve for y.

76.  $\ln y = 2x + 4$

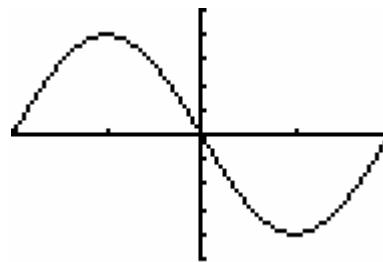
77.  $\ln(y-1) - \ln 2 = x + \ln x$

In exercises 66-67, specify (a) the period, (b) the amplitude, and (c) identify the viewing window shown.

78.  $y = -3\cos(2x)$



79.  $y = -4\sin\left(\frac{\pi}{3}x\right)$



In exercises 68-69, determine (a) the period, (b) the domain, (c) the range, and (d) draw the graph of the function.

80.  $y = 2\sin(4x + \pi) + 3$

81.  $y = -3\tan(3x + \pi) + 2$

In exercises 70-72, solve the equation in the specified interval.

82.  $\tan x = 2.5, 0 \leq x < 2\pi$

83.  $\cos x = -0.7, 2\pi \leq x < 4\pi$  \*

84.  $\sec x = -3, -\pi \leq x < \pi$

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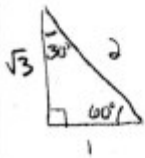
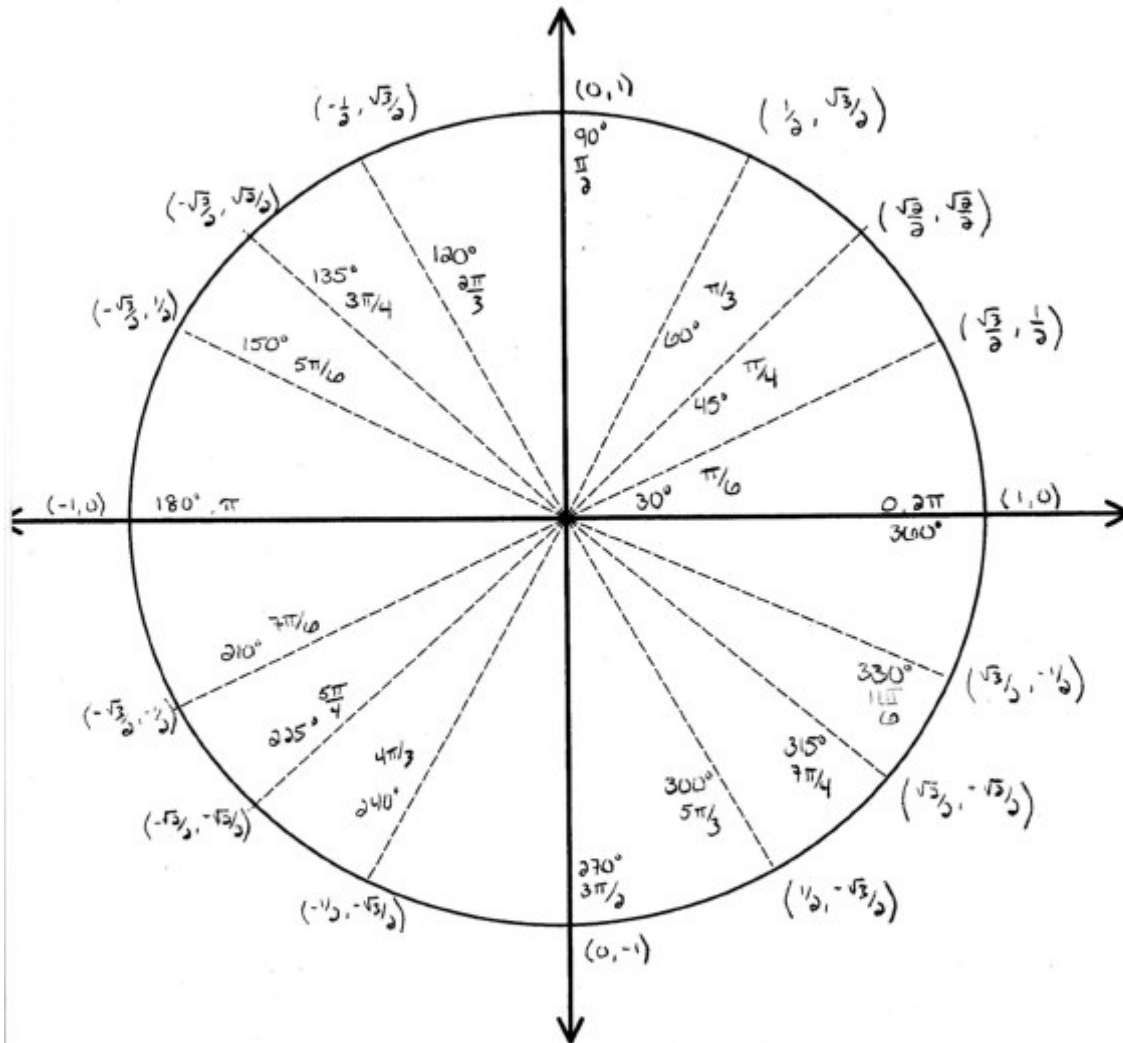
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5 min

Unit Circle

Name: key

Fill in the angles in both degrees and radians. Then write the exact ordered pair for each angle where it intersects the circle.



97 points  
Angles ordered pairs = 1 sign. 65

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### Trigonometric Identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

$$\sec^{-1}(x) = \cos^{-1}\left(\frac{1}{x}\right)$$

$$\csc^{-1}(x) = \sin^{-1}\left(\frac{1}{x}\right)$$

$$\cot^{-1}(x) = \tan^{-1}\left(\frac{1}{x}\right)$$

$$\cot^{-1}(x) = \frac{\pi}{2} - \tan^{-1}(x)$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\tan^2 \theta + 1 = \sec^2 \theta$$

$$1 + \cot^2 \theta = \csc^2 \theta$$

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\cos 2\theta = 1 - 2 \sin^2 \theta$$

$$\cos 2\theta = 2 \cos^2 \theta - 1$$

$$\cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

$$\sin^2 \theta = \frac{1 - \cos 2\theta}{2}$$