

## AP CALCULUS AB SUMMER ASSIGNMENT

Solve each of the following problems, **showing all work**. Do **NOT** just write the answer. Be sure all answers are in simplified form. Box in and/or highlight your answers. The assignment is due on the first day of class. The first unit test of the semester will include topics from this assignment following a brief review of these topics.

**Write each of the following absolute value equations in piecewise form. Show work leading to your answers. Ex:**  $f(x) = |3x + 2|$ . Determine where the absolute value expression is positive and where it is negative by setting  $3x + 2 = 0$  and solving to get  $x = \frac{-2}{3}$ . Since  $3x + 2 \geq 0$  for any  $x \geq \frac{-2}{3}$ , the expression remains positive when the absolute value is dropped. Since  $3x + 2 < 0$  for any  $x < \frac{-2}{3}$ , the expression

becomes negative when the absolute value is dropped.  $f(x) = |3x + 2| = \begin{cases} 3x + 2, x \geq \frac{-2}{3} \\ -3x - 2, x < \frac{-2}{3} \end{cases}$

1.  $f(x) = |2x - 5|$

2.  $f(x) = |4x^2 - 1|$

3.  $f(x) = |1 - x^2|$

**Find each of the following for**  $f(x) = x^2 + 3x + 1$  and  $g(x) = \frac{1}{x + 4}$ . Simplify your answers.

4.  $f(g(x))$

5.  $f(x + h)$

6.  $g^{-1}(x)$

**Find each of the following values in exact form**

7.  $\sin\left(\frac{4\pi}{3}\right)$

8.  $\cos\left(\frac{7\pi}{4}\right)$

9.  $\tan\left(\frac{7\pi}{6}\right)$

10.  $\sin(5\pi)$

11.  $\cos\left(\frac{-2\pi}{3}\right)$

12.  $\csc\left(\frac{3\pi}{2}\right)$

13.  $\sec\left(\frac{2\pi}{3}\right)$

14.  $\cot\left(\frac{11\pi}{6}\right)$

15.  $\csc(\pi)$

**Find each of the following for the piecewise function**  $f(x) = \begin{cases} \sqrt{x}, x \geq 0 \\ 2x + 1, x < 0 \end{cases}$ . **Be sure answers are in exact form. Show your work!!**

16.  $f(-2)$

17.  $f(25)$

18.  $f(-9)$

**Solve each of the following for  $y$  in terms of  $x$ . Show all work.**

19.  $3xy + 2y = -6x + 1$

20.  $3y^2 + 14x = 2x^2$

21.  $9x - 3y + 2xy = 7x^2 + 4y$

22.  $12x^2y + 70xy - 3x^3 + 12x = 9y + 13x^2$

**Sketch the graph of each function.**

23.  $f(x) = (x+2)^2 - 3$

24.  $f(x) = |x+1| + 4$

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

26.  $f(x) = -\sqrt{x-5} + 2$

27.  $f(x) = 2^x + 3$

28.  $f(x) = \frac{1}{2}^{(x-2)}$

29.  $f(x) = -2(x-1)^2 + 4$

30.  $f(x) = 2\sin(\pi x) - 3$

31.  $f(x) = -\cos(2x - \pi)$

32.  $f(x) = e^x - 2$

33.  $f(x) = \ln(x+3)$

34.  $f(x) = \tan\left(\frac{x}{2}\right) + 1$

**Find any asymptotes (vertical, horizontal, or slant) for the following functions and any  $x$ -intercepts. Do Not Graph.**

35.  $f(x) = \frac{x}{x^3 - 3}$

36.  $f(x) = \frac{x^3 + 2x^2 - x - 2}{x^2 + x - 6}$

**Solve each of the following equations for  $x$ . Use algebra and show your work.**

**For trigonometric equations, give all exact solutions on the interval  $[0, 2\pi)$ .**

37.  $x^4 + x^2 - 2 = 0$

38.  $x^{1/2} + \frac{1}{x^{1/2}} - 2 = 0$

39.  $15x - \frac{4}{x} = 4$

40.  $-x^5 + 29x^3 - 100x = 0$

41.  $x^{2/3} + 2x^{1/3} - 15 = 0$

42.  $4x^2 - x^3 = 0$

43.  $-x^3 - 5x^2 + 4x + 20 = 0$

44.  $-x^4 + x^3 + 20x^2 = 0$

45.  $\ln(x^2 - 3x - 5) = 0$

46.  $3 - \frac{6}{x-2} = 0$

47.  $x^{5/2} - 4x^{3/2} - 5x^{1/2} = 0$

48.  $x^{7/3} + x^{4/3} - 12x^{1/3} = 0$

49.  $\ln(x^2 + 5x + 7) = 0$

50.  $x^2e^x - 3xe^x - 10e^x = 0$

51.  $\ln(5x) - \ln(x+2) = 0$

**Solve each trigonometric equation for  $x$ . Give all exact solutions on the interval  $[0, 2\pi)$ .**

52.  $2\sin^2 x - \sin x = 0$

53.  $2\cos^2 x + \cos x - 1 = 0$

54.  $\sin x + \cos x = 0$

55.  $6\tan(2x) = 6$

56.  $2\sin x \cos x = \sqrt{3} \cos x$

57.  $\sec^2 x - \sec x = 2$

58.  $2\sin^2 x - 3\cos x = 0$

59.  $4\cos^2 x = 3$

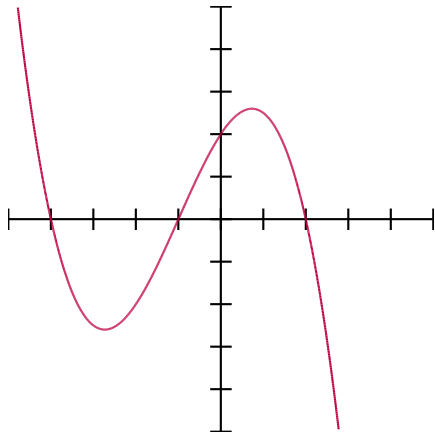
60.  $\tan^2\left(\frac{x}{2}\right) - 3 = 0$

**Sketch a graph of each piecewise function**

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

62.  $f(x) = \begin{cases} \frac{x}{\pi} & x < \pi \\ e^{\frac{x}{\pi}} & \pi \leq x \leq 2\pi \end{cases}$

63. Given the graph of  $f(x)$  below, identify the intervals where  $f$  is increasing and decreasing. Then identify where the values of  $f$  go from negative to positive and positive to negative.



64. Find the area of the region between the lines and the  $x$ -axis using formulas from Geometry. Show your work!!

