



Nazareth Academy High School  
Advance Placement Calculus AB  
Summer Assignment

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Name \_\_\_\_\_

Advanced Placement Calculus AB is an advanced-level mathematics course which utilizes certain aspects of previous math courses that you have taken. In order to ensure your success in the course, there is a mandatory summer assignment packet.

Most topics should be a review. You should not only be familiar with the topics but should know them well enough to be tested on them.

Study your unit circle! You need to know this well for AP Calculus AB.

On the first day of class, you should have your completed summer assignment with you. The assignment will be graded as your first test grade for the year. No work, no credit. Please circle or box your final answers. If the assignment is late, you will lose 20% of your grade each day until it is handed in.

If you have any questions during the summer, please email me.

This is a very challenging course. You should be prepared to work to the best of your ability. Success in the course will be a result of your desire to work hard, both in class and independently.

Have a great summer!

Ms. Souyack

**ALL work is to be done NEATLY on loose-leaf paper. Graphs need to be done on graph paper. Circle or box answers.**

1. Write an equation for the specified condition.

- Through  $(1, -6)$  with slope 4
- The vertical line through  $(0, -7)$
- Through  $(-3, 6)$  and  $(1, -2)$
- With slope  $-4$  and y-intercept 4
- Through  $(3, 1)$  and parallel to  $2x - y = -2$
- Through  $(-2, -3)$  and perpendicular to  $3x - 5y = 1$
- The line  $y = f(x)$  where  $f$  has the following values:

$x$	$-2$	$2$	$4$
$f(x)$	$4$	$2$	$1$

2. Determine whether the function is even, odd, or neither. Also state whether the function is symmetric about the y-axis, origin, or neither.

- $f(x) = x^{1/5}$
- $g(x) = e^{-x^2}$
- $h(x) = 1 - \cos x$
- $f(x) = \frac{x^4+1}{x^3-2x}$
- $g(x) = 1 - \sin x$

3. **a)** Describe the transformation **in words** made on the “parent” function for each given function, Find **b)** the Domain **c)** the Range, and **d)** Graph the function.

- $h(x) = |x| + 2$
- $f(x) = 2e^{-x} - 3$
- $g(x) = 2 \sin(3x) - 1$

4. Given the following rational functions: **a)** Identify all x and y intercepts using point notation **b)** Identify any vertical and/or horizontal asymptotes using proper notation **c)** Sketch the graph, including at least 3 additional points and asymptotes.

- $f(x) = \frac{x^2}{x^2-4}$
- $g(x) = \frac{1}{x-7}$

5. Sketch the piecewise-defined functions.

$$a. f(x) = \begin{cases} 2x + 3, & x \leq 1 \\ -x + 4, & x > 1 \end{cases}$$

$$b. g(x) = \begin{cases} \sqrt{-x}, & x < 0 \\ \sqrt{x}, & x \geq 0 \end{cases}$$

6. Write a formula for the function as described and use the formula to find the indicated value of the function.

- a. The area  $A$  of a circle as a function of its diameter  $d$ : the area of the circle of diameter 4 inches.
- b. The height  $h$  of an equilateral triangle as a function of its sides length  $s$ : the height of an equilateral triangle of sides length 3 m.
- c. The surface area  $S$  of a cube as a function of the length of the cube's edge  $e$ : the surface area of a cube of edge length 4 ft.
7. Given the functions  $f(x) = \frac{1}{x}$  and  $g(x) = \frac{1}{\sqrt{x+2}}$  find the following. Do not rationalize.  
(Composition of functions)
- a.  $f(g(-1))$       b.  $g(f(2))$       c.  $f(f(x))$       d.  $g(g(x))$

8. Simplify and make sure all terms have positive exponents:  $\left(\frac{x^{-3}y^2}{x^{-4}y^{\frac{3}{2}}}\right)^2$

9. Find the inverse.

a.  $y = x^3 - 1$

b.  $y = x^{2/3}$

10. Solve for  $x$ . Leave answers exact or round to THREE decimal places if needed.

a.  $(1.045)^x = 2$

b.  $3e^{2x} - 4 = 1$

c.  $\ln x + \ln(x + 1) = 0$

d.  $\log_2(x + 1) = 3$

e.  $2 \ln(3 - x) - 4 = 0$

11. Use your calculator to solve the following for  $x$  (find intersection points).

$$e^x + e^{-x} = 3$$

## Trigonometry

12. Given  $y = -3 \tan(x + \pi)$

- Determine the period, amplitude, and phase shift.
- State the domain.
- State the range
- Find one vertical asymptote (find the x-value where this function is undefined)

13. Solve the equation in the given interval.

a.  $\csc x = 2, 0 \leq x < 2\pi$                       b.  $\sec^2 x = \frac{4}{3}, 0 \leq x < 2\pi$

14. Find all six trigonometric values given  $\cos x = -\frac{2}{3}$  and  $\sin x < 0$  BY USING TRIG IDENTITIES.

15. Find the values of the six trigonometric functions at the angle  $\theta$ . Assume theta is in Quadrant I. Give an exact answer. (You are solving for the six trig ratios, not the angle theta.) *Note: you are given an inverse trig function. Inverse trig functions are angles.*

$$\theta = \sin^{-1}\left(\frac{8}{17}\right)$$

16. Evaluate the expression. Exact Answers.

$$\sin\left(\arccos\left(\frac{7}{11}\right)\right)$$

17. Solve the following equations.

a.  $\cos 2x - 1 = 0$

b.  $\cos \frac{x}{2} = \frac{\sqrt{2}}{2}$

18. Solve the following equations on  $[0, 2\pi)$ .

a.  $\sec x \csc x = 2 \csc x$

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

19. The purchase price of a new machine is \$14,000, and its value will decrease by \$950 per year. Use this information to write a linear equation that gives the value  $V$ , in dollars, of the machine  $t$  years after it is purchased.

20. Convert the degree measure to radian measure as a multiple of  $\pi$  and as a decimal accurate to three decimal places.

a.  $340^\circ$

b.  $-390^\circ$

21. Convert the radian measure to degree measure.

a.  $\frac{\pi}{4}$

b.  $-\frac{5\pi}{6}$

22. Evaluate the sine, cosine, and tangent of the angle. Do not use a calculator.

a).  $-60^\circ$

b.  $\frac{13\pi}{6}$

23. Use a calculator to evaluate the trigonometric function. Round your answer to four decimal places.

$\tan(41^\circ)$

24. Use a calculator to evaluate the trigonometric function. Round your answer to four decimal places.

$\sec\left(\frac{12\pi}{5}\right)$