

Hello, AP Calculus AB students,

This important message is for all students planning on taking AP Calculus AB during the 2023-2024 school year. We are so excited to have you in class and want to take this opportunity to share with you the *Are You Ready?* assignment to help you review your prior knowledge so that you are prepared for the rigors of Calculus.

Your foundation of College Algebra and College Trigonometry concept knowledge is essential to your success as a Calculus student. We have selected problems highlighting skills and conceptual understanding that are directly related to what you will encounter in Calculus. Your algebra and trigonometry fluency must be an anchor for you next year, not a hindrance.

Therefore, it is essential that you take the time to complete these problems at a high level of quality. This means working through them to understand what you are doing and why you are doing it (not just doing them for the sake of getting them done). Be self-aware and honest with yourself when you work through the problems. If you run across a topic that you feel unsure about and/or you don't think you could explain to someone else why it works, take the time to remediate. Utilize your notes from prior classes, internet resources, each other, etc.

You are accountable to know, conceptually understand, and be able to apply your knowledge of the concepts represented in these problems.

The due date for the *Are You Ready?* problems depends on which semester you end up taking AP Calculus AB. We will send out messaging to let you know which semester you are enrolled in once that information becomes available to us. (If you are also taking College Trigonometry next year, then you will be taking AP Calculus AB in the Spring. If you are also taking AP Calculus BC next year, then you will be taking AP Calculus AB in the Fall.)

- For students taking AP Calculus AB in the Fall: Due the first day of class, which is **August 17, 2023**.
- For students taking AP Calculus AB in the Spring: Due the first day of class, which is **January 9, 2024**.

Please plan ahead and pace yourself in the weeks leading up to your AP Calculus AB class so that you can complete your review assignment and do any necessary studying required to reclaim mastery of the included content before class begins. **We suggest putting reminders in your personal calendar now.** Time will not allow for us to spend class time working on the *Are You Ready?* assignment, as we will jump into learning Calculus concepts right away. You will be regularly assessed on your mastery of the *Are You Ready?* assignment concepts.

The *Are You Ready?* formatting instructions, problems, and final answers are included below. Please contact one of us before Thursday, May 25, if you have any questions.

Thank you and see you next year!

Mr. Pfeifer, Mrs. Pourbaix, and Miss Rentel

tpfeifer@psdschools.org, spourbai@psdschools.org, arentel@psdschools.org

Are You Ready For Calculus?
Day 1 - Knowing your Graphs

Name _____

1) Determine the equations of the following lines:

- a) The line through $(-1, 3)$ and $(2, -4)$.
- b) The line through $(-1, 2)$ and perpendicular to the line $2x - 3y + 5 = 0$.

2) Find the point of intersection of the lines: $3x - y - 7 = 0$ and $x + 5y + 3 = 0$.

3) Find the domain of the functions:

a) $f(x) = \frac{3x+1}{\sqrt{x^2+x-2}}$ b) $g(x) = \frac{5x-3}{2x+1}$

4) Simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$, where

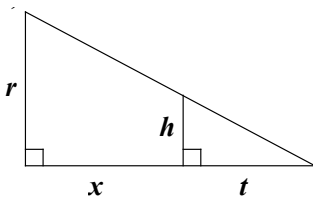
a) $f(x) = 2x^2 + 3x - 4$ b) $f(x) = \frac{1}{x+1}$

5) The graph of a quadratic function (a parabola) has intercepts $(-1, 0)$ and $(3, 0)$ and a range consisting of all numbers less than or equal to 4. Determine an expression for the function.

6) Find the inverse of the functions:

a) $f(x) = 3x^2 + 4$ b) $f(x) = \frac{x+2}{5x-1}$

7) Express x in terms of the other variables in the picture.



8) A water tank has the shape of a cone. The tank is 10m high and has a radius 3m at the top. If the water is 5m deep (in the middle) what is the surface area of the top of the water?

9) Two cars start moving from the same point. One travels south at 100km/hr, the other west at 50 km/hr. How far apart are they two hours later?

10) Graph the following piecewise function without the use of a calculator: $f(x) = \begin{cases} x^2, & \text{for } [0,2] \\ -2x+8, & \text{for } (2,3] \\ 1, & \text{for } (3,5) \end{cases}$

Are You Ready for Calculus?

Day 1-Knowing Your Graphs

1) a) $y - 3 = \frac{-7}{3}(x + 1)$ or $y + 4 = \frac{-7}{3}(x - 2)$ or $y = \frac{-7}{3}x + \frac{2}{3}$

b) $y - 2 = \frac{-3}{2}(x + 1)$ or $y = \frac{-3}{2}x + \frac{1}{2}$

2) (2, -1)

3) a) $(-\infty, -2) \cup (1, \infty)$

b) $\left(-\infty, -\frac{1}{2}\right) \cup \left(-\frac{1}{2}, \infty\right)$

4) a) $2h + 4x + 3$

b) $\frac{-1}{(x+1)(x+h+1)}$

5) $y = -(x-1)^2 + 4$

6) a) $y = \sqrt{\frac{x-4}{3}}, x \geq 4, y \geq 0$

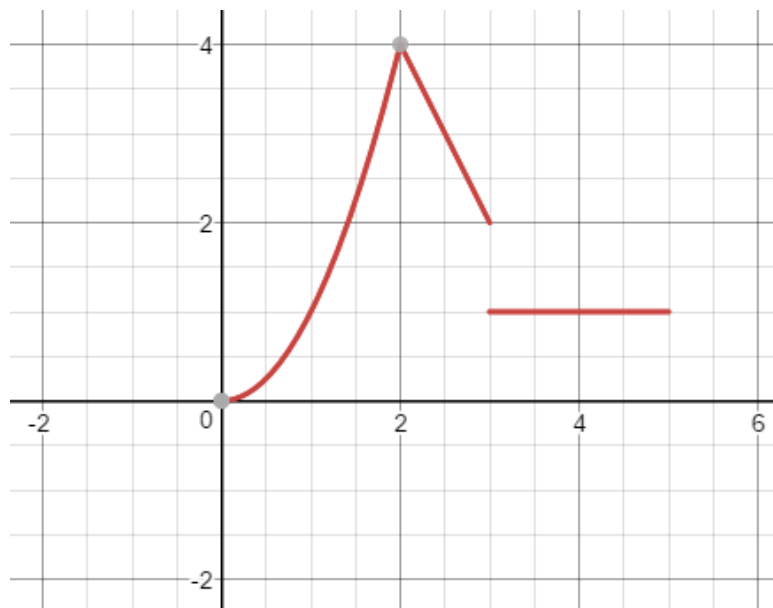
b) $y = \frac{x+2}{5x-1}, x \neq \frac{1}{5}$

7) $x = \frac{rt - ht}{h}$

8) $SA \approx 7.069m^2$

9) After two hours the cars are about 223.61 km apart from each other.

10)



Are You Ready For Calculus?
Day 2 - Knowing your Algebra!!

Name _____

1) Solve the following equations for the indicated variables:

a) $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$, for a

b) $V = 2(ab + bc + ca)$, for a

2) Simplify each expression without negative exponents:

a) $\frac{(2a^2)^3}{b}$

b) $\frac{a(2/b)}{3/a}$

c) $\frac{a^{-1}}{(b^{-1})\sqrt{a}}$

d) $\left(\frac{a^{2/3}}{b^{1/2}}\right)^2 \left(\frac{b^{3/2}}{a^{1/2}}\right)$

3) Rationalize the denominator (remove the sum/difference from the denominator by multiplying by the denominator's conjugate):

a) $\frac{4}{1+\sqrt{5}}$

b) $\frac{1}{1-\cos x}$

4) Simplify by factoring out the greatest common factor(s) from each expression:

a) $12(4x+5)^2(5x+1)^2 + 10(4x+5)^3(5x+1)$

b) $3x^2(3x+4)^{-2} + 6x^3(3x+4)^{-3}$

c) $(x^2+1)^{-1/2} - x^2(x^2+1)^{-3/2}$

d) $6x^2(4x-3)^{5/3} + 9x(4x-3)^{2/3}$

5) Factor completely:

a) $x^6 - 16x^4$

b) $12x^3 - 2x^2 - 24x$

c) $8x^3 - 27$

d) $18x^2 - 15x - 18$

e) $x^4 - 7x^2 + 12$

f) $8x^3 - 20x^2 - 6x + 15$

6) Simplify:

a) $\frac{x^3 - 9x}{x^2 - 7x + 12}$

b) $\frac{x^2 - 2x - 8}{x^3 + x^2 - 2x}$

c) $\frac{\frac{1}{x} - \frac{1}{5}}{\frac{1}{x^2} - \frac{1}{25}}$

d) $\frac{9 - x^{-2}}{3 + x^{-1}}$

7) Find all real solutions:

a) $9x^7 - 25x^5 = 0$ b) $2x + 1 = \frac{9}{x + 2}$

8) Determine the roots of each function by completing the square:

a) $f(x) = 4x^2 + 12x + 3$ b) $g(y) = 9y^2 - 6y - 9$

9) Find the remainders on division of:

a) $x^5 - 4x^4 + x^3 - 7x + 1$ by $x + 2$ (using synthetic division)

b) $x^5 - x^4 + x^3 + 2x^2 - x + 4$ by $x^3 + 1$ (using long division)

10) Solve for x :

a) $x^2 + 2x \leq 3$

b) $\sqrt{4x^2 - 11} - 6 = x + 2$

Are You Ready for Calculus?

Day 2-Knowing Your Algebra!!

1) a) $a = \frac{bcx}{bc - cy - bz}$

b) $a = \frac{V - 2bc}{2b + 2c}$

2) a) $\frac{8a^6}{b}$

b) $\frac{2a^2}{3b}$

c) $\frac{b}{a^{\frac{2}{3}}}$

d) $a^{\frac{5}{6}}b^{\frac{1}{2}}$

3) a) $\sqrt{5} - 1$

b) $\frac{1 + \cos x}{\sin^2 x}$

4) a) $2(4x + 5)^2(5x + 1)(50x + 31)$

b) $\frac{3x^2(5x + 4)}{(3x + 4)^3}$

c) $\frac{1}{(x^2 + 1)^{\frac{3}{2}}}$

d) $3x(4x - 3)^{\frac{2}{3}}(8x^2 - 6x + 3)$

5) a) $x^4(x - 4)(x + 4)$

b) $2x(3x + 4)(2x - 3)$

c) $(2x - 3)(4x^2 + 6x + 9)$

d) $3(3x + 2)(2x - 3)$

e) $(x^2 - 3)(x + 2)(x - 2)$

f) $(4x^2 - 3)(2x - 5)$

6) a) $\frac{x(x + 3)}{x - 4}$

b) $\frac{x - 4}{x(x - 1)}$

c) $\frac{5x}{5 + x}$

d) $\frac{3x - 1}{x}$

7) a) $x = -5/3, 0, 5/3$

b) $x = -7/2, 1$

8) a) $x = \frac{-3 \pm \sqrt{6}}{2}$

b) $y = \frac{1 \pm \sqrt{10}}{3}$

9) a) -89

b) $x^2 + 3$

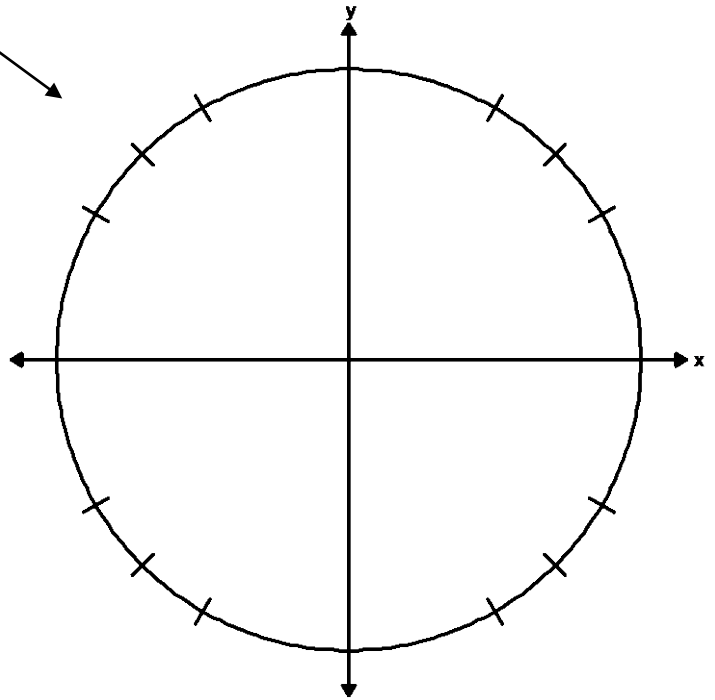
10) a) $x = [-3, 1]$

b) $x = -3, 25/3$

Are You Ready For Calculus?
Day 3 - Knowing your Trigonometry and Logarithms!!

Name _____

1) Try to complete the Unit Circle by memory only.



2) Without using a calculator, evaluate the following:

- a) $\cos 210^\circ$ b) $\sin \frac{5\pi}{4}$
 c) $\tan^{-1}(-1)$ d) $\sin^{-1}(-1)$
 e) $\cos \frac{9\pi}{4}$ f) $\sin^{-1} \frac{\sqrt{3}}{2}$
 g) $\tan \frac{7\pi}{6}$ h) $\cos^{-1}(-1)$

Become extremely familiar with the following trigonometric functions and identities:

$\sin x = \frac{1}{\csc x}$	$\csc x = \frac{1}{\sin x}$	$\sin^2 x + \cos^2 x = 1$
$\cos x = \frac{1}{\sec x}$	$\sec x = \frac{1}{\cos x}$	Pythagorean Identities: $1 + \cot^2 x = \csc^2 x$
$\tan x = \frac{1}{\cot x} = \frac{\sin x}{\cos x}$	$\cot x = \frac{1}{\tan x} = \frac{\cos x}{\sin x}$	$\tan^2 x + 1 = \sec^2 x$

3) Use trigonometric functions and identities to transform the left side of the equation into the expression on the right (do not move expressions to opposite sides of the equal sign → leave the right side completely alone.)

- a) $\tan x \cot x = 1$ b) $(1 + \cos x)(1 - \cos x) = \sin^2 x$ c) $\sin^2 x - \cos^2 x = 2 \sin^2 x - 1$
- d) $\sin x(\cot x + \tan x) = \sec x$ e) $\frac{\tan x + \cot x}{\tan x} = \csc^2 x$

4) Solve each equation on $[0, 2\pi)$.

a) $4\sin^2 \theta - 3 = 0$

b) $-3\cos\left(2\theta - \frac{\pi}{2}\right) - 3 = 0$

c) $\cos^2 \theta + 2\sin \theta \cos \theta - \sin^2 \theta = 0$
(use Double Angle formulas)

d) $4\sin^2 \theta + 7\sin \theta = 2$

e) $\sqrt{3}\tan\left(3\theta + \frac{\pi}{2}\right) + 3 = 2$

5) Write the expression as the sum and/or difference of logarithms. Express powers as factors (expand the logarithm):

a) $\log_{10} \frac{5\sqrt{y}}{x^2}$

b) $\log_5 \sqrt[5]{\frac{a^2b}{c^4}}$

c) $\ln\left(\frac{x^3\sqrt{x^2+1}}{x^2-3x+2}\right)$

6) Write the expression as the logarithm of a single quantity (condense the logarithm):

a) $\frac{3}{2}\ln 5t^6 - \frac{3}{4}\ln t^4$

b) $\frac{1}{2}[\ln(x+1) - 2\ln(x-1)] + \frac{1}{3}\ln x$

7) Solve each equation for x:

a) $14e^{3x+2} = 560$

b) $2\ln(\sqrt{x}) - \ln(1-x) = 2$

c) $\log_7(x+4) = \log_7(5-x) - \log_7(x-3)$

d) $7^{x+3} = e^x$

Are You Ready For Calculus?

Name _____

Day 3 - Knowing your Trigonometry and Logarithms!! ANSWERS

1) see unit circle

2a) $-\frac{\sqrt{3}}{2}$

2b) $-\frac{\sqrt{2}}{2}$

2c) $-\frac{\pi}{4}$

2d) $-\frac{\pi}{2}$

2e) $\frac{\sqrt{2}}{2}$

2f) $\frac{\pi}{3}$

2g) $\frac{\sqrt{3}}{3}$

2h) π

3a-e) work with left side of equation to achieve answer on right side of equation

4a) $\theta = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

4b) $\theta = \frac{3\pi}{4}, \frac{7\pi}{4}$

4c) $\theta = \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}, \frac{15\pi}{8}$

4d) $\theta \approx 0.253, 2.889$

4e) $\theta = \frac{\pi}{9}, \frac{4\pi}{9}, \frac{7\pi}{9}, \frac{10\pi}{9}, \frac{13\pi}{9}, \frac{16\pi}{9}$

$$5a) \log(5) + \frac{1}{2}\log(y) - 2\log(x)$$

$$5b) \frac{2}{5}\log(a) + \frac{1}{5}\log(b) - \frac{4}{5}\log(c)$$

$$5c) \ln(x) + \frac{1}{3}\ln(x^2 + 1) - \ln(x - 2) - \ln(x - 1)$$

$$6a) \ln(5^{3/2}t^6)$$

$$6b) \ln\left(\frac{(x+1)^{1/2}x^{1/3}}{(x-1)}\right)$$

$$7a) x = \frac{\ln(40) - 2}{3}$$

$$7b) x = \frac{e^2}{e^2 + 1}$$

$$7c) x = -1 + 3\sqrt{2}$$

$$7d) x = \frac{3\ln(7)}{1 - \ln(7)}$$