

Calculus Summer Assignment

Name: _____

While you are enjoying your summer, I would like to ask you to take time to complete the attached assignments. They are designed to help you make the transition into this challenging course as smooth as possible.

While the graphing calculators will be used in class for some things, there are *no calculators allowed* on this packet. You should be able to do everything without a calculator (obviously I will not be there to monitor this requirement, but there will be no calculators permitted on the assessment related to these topics).

Your summer assignment consists of problems that cover the following 5 areas:

I. Algebra

II. Trigonometry

III. Exponential and Logarithms

IV. Graphing

V. Practice Pre-Requisite Assessment

It is very important that you complete the summer work and have a firm understanding of the prerequisite skills, as we will be building on these concepts throughout the course. This assignment is **DUE ON THE FIRST DAY OF SCHOOL**. All work must be neatly shown for each problem. Use graph paper for the problems that require you to graph.

***There will be an assessment on the summer packet material on the 3rd day of school. The first 2 classes you will have an opportunity to ask questions.**

Name:

Show all work - no credit will be awarded for answers missing appropriate work.

No calculators! (There is a non-calculator section on the AP Exam, so it is the expectation that students will not use their calculators to solve these problems. It is acceptable if students use their calculators to **check** their work.)

Section I: Algebra Review

Identify the following statements as true or false.

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

2. $\frac{1}{p+q} = \frac{1}{p} + \frac{1}{q}$ _____

3. $\frac{2k}{2x+h} = \frac{k}{x+h}$ _____

4. $3 \cdot \frac{a}{b} = \frac{3a}{b}$ _____

5. $3 \cdot \frac{a+b}{c} = \frac{3a+b}{c}$ _____

6. $\sqrt{a^2+b^2} = a+b$ _____

Identify the following statements as true or false over the set of real numbers. Give a counter example for any false statement.

7. $x^3+1 > x^3$ _____

8. $x^3+x > x^3$ _____

9. $x^2 \geq 0$ _____

10. $x^2 \geq x$ _____

11. $2x \geq x$ _____

12. $\sqrt{x} \geq 0$ _____

13. $-x \leq 0$ _____

14. $\frac{1}{x} \leq x$ _____

15. $x \leq |x|$ _____

16. Solve $xy' + y + 1 = y'$ for y' .

17. Given $f(x) = x^2 - 3x + 4$, find $f(x+2) - f(2)$

18. Factor: $x^2(x-1) - 4(x-1)$

Simplify each expression.

$$19. \frac{\frac{x^2-1}{x}}{\frac{x+1}{x^3}} \underline{\hspace{2cm}}$$

$$20. \frac{\frac{1}{x} + \frac{4}{x^2}}{3 - \frac{1}{x}} \underline{\hspace{2cm}}$$

Simplify by rationalizing the numerator.

Example:

$$\frac{\sqrt{x+4}-2}{x} = \frac{\sqrt{x+4}-2}{x} \cdot \frac{\sqrt{x+4}+2}{\sqrt{x+4}+2} = \frac{x+4-4}{x(\sqrt{x+4}+2)} = \frac{x}{x(\sqrt{x+4}+2)} = \frac{1}{\sqrt{x+4}+2}$$

$$21. \frac{\sqrt{x+9}-3}{x} \underline{\hspace{2cm}}$$

$$22. \frac{\sqrt{x+h}-\sqrt{x}}{h} \underline{\hspace{2cm}}$$

Solve each equation or inequality for x over the set of real numbers.

$$23. 2x^4 + 3x^3 - 2x^2 = 0 \underline{\hspace{2cm}} \quad 24. \frac{2x-7}{x+1} = \frac{2x}{x+4} \underline{\hspace{2cm}}$$

$$25. |3x + 7| < -5$$

Section II: Trigonometry Review

1. You must have the first quadrant of the unit circle (all 6 functions and arc-functions) memorized to the point where you can answer any question within 5 seconds. (think chart quiz)

examples

a. $\tan\left(\frac{\pi}{6}\right) = \underline{\hspace{2cm}}$ b. $\arcsin\left(\frac{\sqrt{3}}{2}\right) = \underline{\hspace{2cm}}$ c. $\csc\left(\frac{\pi}{4}\right) = \underline{\hspace{2cm}}$

Complete each of the following using trigonometric identities and formulas.

2. $\sin^2 x + \cos^2 x = \underline{\hspace{2cm}}$

3. $1 + \cot^2 x = \underline{\hspace{2cm}}$

4. $1 + \tan^2 x = \underline{\hspace{2cm}}$

5. $\sin(A + B) = \underline{\hspace{2cm}}$

Solve each trigonometric equation for $0 \leq x \leq 2\pi$.

6. $\sqrt{3} + 2\sin(x) = 0$

7. $2\cos^2(x) - 1 = 0$

8. $\cos(2x) + 1 = 0$

9. $2\sin^2(x) + \sin(x) - 1 = 0$

10. Prove each of the following identity

a. $\sec(x) - \tan(x)\sin(x) = \cos(x)$

b. $(\sin x + \cos x)^2 + (\sin x - \cos x)^2 = 2$

Section III: Exponential and Logarithm Review

Solve each exponential or logarithmic equation.

1. $5^{x-3} = 125$

2. $8^{2x+1} = 16^x$

3. $81^{3/4} = 3^x$

4. $\log_2(32) = x$

5. $\log_x(441) = 2$

6. $\log_2(x^2 - 5) = 32$

7. A bacteria is known to triple every 5 hours. If there are 150 bacterium present at 8am, when did the number of bacterium double? When will there be 1000000 bacterium present? Find exact values.

8. A population of 5000 animals decreases at an annual rate of 22% per year. How long before there are only 100 animals left? Determine the exact value.

Expand each of the following using the laws of logs.

9 . $\log_3 5x^2$ _____

10 . $\ln \frac{5x}{y^2}$ _____

Section IV: Graphing Review

Graph the following functions, a sketch of your calculator screen is **NOT** acceptable. Draw and label your own axes. Be sure to indicate the domain and range for each of the functions.

1. $f(x) = x$

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

3. $f(x) = x^3$

4. $f(x) = |x|$

5. $f(x) = [x]$

6. $f(x) = \frac{1}{x}$

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

8. $f(x) = \frac{1}{1+x^2}$

9. $f(x) = \sqrt{x}$

10. $f(x) = e^x$

11. $f(x) = \ln x$

12. $f(x) = \sqrt{1-x^2}$

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

14. $f(x) = \cos x$

15. $f(x) = \csc x$

16. $f(x) = \sec x$

17. $f(x) = \tan x$

18. $f(x) = \cot x$

AP Calculus PreReq Assessment Items:

As a student in entering AP Calculus, you should be able to solve each of the following, without the use of a calculator.

1. Simplify: $\frac{(x^2yz^{-2})^3}{(xy^2z)^2}$

2. An equivalent algebraic expression to $m^{(4x-7y)}$ is:

3. Factor: $2y^4 - 32x^4$.

4. Simplify: $\frac{x}{x^2 + 5x + 6} - \frac{2}{x^2 + 3x + 2}$

5. After rationalizing the denominator of $\frac{3}{1-\sqrt{2}}$, an equivalent expression is:

6. Simplify: $\frac{\sqrt[5]{64x^5y^{-1}}}{\sqrt[5]{2y^4}}$

7. Simplify: $32^{4/5}$

8. Solve for x: $(x+a)(x-b) = x^2 - 1$

9. After clearing the numerator and denominator of fractions, $\frac{2x + \frac{1}{4}}{3x - \frac{1}{5}}$ is equivalent to:

10. Given: $1 - 5x = \sqrt{6x-7}$, find all real values of x which satisfy the equation.

11. The radius of a circular fountain is 10 ft. A sidewalk of uniform width is constructed around the outside of the fountain and has an area of 69π ft². How wide is the sidewalk?

12. Use "completing the square" to rewrite $x^2 - 4x + 3 = 0$ in the form $(x-c)^2 = d$.

13. Write an equation for y in terms of x assuming that y is proportional to x and y = 42 when x = 6.

14. Given the system of equations $\begin{cases} 4x + 2y = 14 \\ 2x - 8y = 8 \end{cases}$, find the value of y:

15. Given: $f(x) = 3 + x^2$, find $f(x+h) - f(x)$.

16. Given: $f(x) = \sqrt{x^2 - 9}$, find $f(x-3)$.

17. What is the domain of the function $y = \frac{5}{\sqrt{9-x}}$?

18. Find the slope-intercept form of the line through (1,4) and (3,-2).

19. Temperature T in degrees Fahrenheit is given by $T = \frac{9}{5}C + 32$ where C is temperature in degrees Celsius. What is the Celsius equivalent to 77°F ?
20. Given $g(2) = 4$ and $f(x) = x/2$, find $f(g(2))$.
21. Find the point(s) of intersection of the curves $x^2 + y^2 = 1$ and $y + x = 0$.
22. Given $f(x) = -3x^2 - 18x - 15$, find the vertex and the maximum or minimum value.
23. Solve for x : $2 \leq 5 - 2x \leq 22$
24. Solve for x : $|3x - 2| - 6 \geq 0$
25. Solve for x : $x^2 - 35 \leq 1$
26. Find the roots of $f(x) = (x^2 - 7x + 12)^2$ and state the multiplicity of each.
27. Solve for x : $e^{-4x} = e$.
28. Solve for x : $3^{4x+1} - 5 = 22$.
29. Is the point $(\frac{-\sqrt{35}}{6}, \frac{-1}{6})$ inside, outside, or on the unit circle?
30. Find z , given that:
$$\sin(z) = -\cos(z) \text{ and } \frac{3\pi}{2} \leq z \leq 2\pi$$
31. Given $f(x) = \sin(4x)$, find $f(\frac{\pi}{4})$.
32. Given: $2\sin(x) = 1$, and $90^\circ \leq x \leq 180^\circ$. Find x .
33. What is the period of $y = \sin(-2x)$?
34. Simplify the expression $(\frac{\cot \theta \sec \theta}{\csc^2 \theta})$:
35. Simplify the expression $(\sec t - \tan t)(\sec t + \tan t)$: