

June, 2009

WELCOME TO AP CALCULUS!

AP Calc is a very intensive course of study. In order to maximize class time, you are required to complete the problems below showing how you obtained your answers. You will be tested on this material during the first week of school.

You should be **proficient** in the following skills:

- Factoring polynomials and simplifying expressions
- Expanding binomials to a power (Binomial Theorem)
- Finding equations of lines, relationship of parallel and perpendicular lines
- Graphing basic functions and their shifts including polynomial, rational, exponential, logarithmic, and trigonometric
- Finding zeros of a function and roots of an equation including polynomial, rational, exponential, logarithmic, and trigonometric
- Finding the points of intersection of two functions
- Operations with functions including composition and finding the inverse
- Evaluating trigonometric functions in radian mode

You will need to use a graphing calculator on a daily basis. I have found that most students can use the TI-83 plus or TI- 84 calculator with ease. This is the calculator that I will use for class demonstrations. You should not invest in a calculator that does algebraic processes for you. You will need to be able to do most of the work without a calculator using your calculator to confirm your results or ascertain the reasonableness of your solutions.

Please bring a **3 ring binder** to class, pencil, and calculator.

Review problems, some will require **graph paper, show appropriate detail leading to your answers on additional paper:**

1. Find all intercepts. Sketch the graph. Identify domain and range. Check for symmetry with respect to the y-axis and to the origin.

a. $y^2 = x^3 - 4x$

b. $xy = 1$

c. $y = \sqrt{9 - x^2}$

d. $y = \log_4(x - 2)$

e. $y = e^{x+2} - 1$

2. Create a function that has the following intercepts (there may be more than one correct answer.)

a. $x = -2$, $x = 4$, and $x = 6$.

b. $x = -5/2$, $x = 2$, and $x = 1/2$.

3. Find the points of intersection of the graphs:

a. $x^2 + y^2 = 5$, $x - y = 1$

b. $y = x^3 - 2x^2 + x - 1$, $y = -x^2 + 3x - 1$

3. Find the equation of the line satisfying the given information:

a. passes through $(-3, -4)$ and $(1, 4)$

b. passes through $(-2, 1)$ and is parallel to $2x - 3y = 6$

c. passes through $(5, 3)$ and is perpendicular to $3x + 4y = 10$

4. Find the distance between the lines $x + y = 1$ and $x + y = 5$. Recall that distance must be along a perpendicular path.

5. Graph the piecewise function; find a. $f(-1)$ b. $f(0)$ c. $f(1)$ d. $f(x^2 + 1)$,

$$f(x) = \begin{cases} 2x + 1, & x < 0 \\ 2x + 2, & x \geq 0 \end{cases}$$

6. If $f(x) = x^3$ find $\frac{f(x + \Delta x) - f(x)}{\Delta x}$

7. Describe the shift of the graph of $f(x)$ for each of the following:

a. $f(x - 4)$

b. $f(x + 2)$

c. $f(x) + 4$

d. $f(x) - 1$

e. $2f(x)$

f. $f(-x)$

8. Let $f(x) = x^2 - 1$ and $g(x) = \cos x$

a. find $f(g(x))$

b. find $g(f(x))$

9. If $f(x) = e^{x-2} + 3$ find $f^{-1}(x)$

10. A function is **even** if it has y-axis symmetry; a function is **odd** if it has origin symmetry. Determine if the following functions are even, odd, or neither:
- $y = \sin x$
 - $y = x^3 + 1$
 - $y = x^3 + x$
 - $y = 3x^2 - 4$
11. Give 3 examples of irrational numbers.
12. Since every repeating and terminating decimal is rational find the fraction that is equivalent to each decimal:
- $\overline{.023}$
 - $\overline{2.135}$ ie., $2.135353535\dots$
13. Solve the following:
- $|9 - 2x| < 1$
 - $x^4 - x \leq 0$
14. Prove that the points are the vertices of a right triangle: (4, 0), (2, 1), and (-1, -5).
15. Prove that the points are the vertices of an isosceles triangle: (1, -3), (3, 2), (-2, 4).
16. Find all x values such that the distance between the points is 5: (2, -1), (x, 2).
17. Write the equation of the circle in standard form, determine the center and the radius:
- $x^2 + y^2 - 2x + 6y + 10 = 0$
 - $4x^2 + 4y^2 - 4x + 2y - 1 = 0$
18. Evaluate without a calculator:
- if $\sin \theta = 1/2$ then $\cos \theta = \underline{\hspace{1cm}}$
 - if $\sin \theta = 1/3$ then $\tan \theta = \underline{\hspace{1cm}}$
 - if $\cos \theta = 4/5$ then $\cot \theta = \underline{\hspace{1cm}}$
 - if $\sec \theta = 13/5$ then $\csc \theta = \underline{\hspace{1cm}}$
19. Find 2 solutions for each equation, express your answer in radians ($0 \leq \theta < 2\pi$)
- $\cot \theta = -\sqrt{3}$
 - $\sin \theta = -\sqrt{3}/2$
20. Solve the equation for θ ($0 \leq \theta < 2\pi$):
- $\tan^2 \theta - \tan \theta = 0$
 - $2 \cos^2 \theta - \cos \theta = 1$

