

## *GET READY FOR CALCULUS !*

### **Learning Goal:**

The following outline provides the prospective Calculus student with topics which, if mastered, are believed to help establish a more successful start in the study of Calculus.

### **Expectations:**

- Students enrolled in AP Calculus AB/BC at Panther Creek High School are expected to complete the problems attached to this outline during the summer prior to the school year they will take AP Calculus.
- These problems are *due the first day of school*, and there are no exceptions to this rule.
  - You will submit the packet to your AP Calculus AB teacher on August 25<sup>th</sup>.
  - Students enrolled only in AP Calculus BC for the spring will need to turn the packet in to Student Services on August 25<sup>th</sup>.

### **Evaluation of Summer Assignment:**

The packet will be graded and will count as *two (2) quiz grades*.

### **Summer Support/Resources for Success:**

- Please make reference to your notes from Algebra 2, Advanced Functions and Modeling, and/or Precalculus if you need support in mastery of any of the problems listed.
- An additional recommendation for needed academic support is Wake County Public School's online "Success Series" at <http://www.wcpss.net/success-series/> . This series includes lessons on a variety of topics which are taught by Wake County math teachers.
- Other websites which may be helpful:
  - <http://www.purplemath.com/modules/index.htm>
  - <http://tutorial.math.lamar.edu/>
  - <http://www.clarku.edu/~djoyce/trig/>
  - <http://home.earthlink.net/~djbach/precalc.html>
  - <http://www.mecca.org/%7Ehalfacre/MATH/pfirstreview.html>

Please work the problems in this Summer Assignment to the best of your ability, and give yourself enough time to review your work for accuracy. Thank you for accepting this challenge. We anxiously await your participation in the AP Calculus program of Panther Creek High School.

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\*AP Calculus AB/BC teachers are Audit approved by The College Board AP Program

## GENERAL OUTLINE for AP CALCULUS READINESS

### I. Geometry Mechanics

#### A. Logically equivalent statements

1. conditional and contrapositive
2. converse and inverse

#### B. Area

1. familiar shapes (2-D)
2. unfamiliar regions formed by circles, lines, and polygons
3. lateral and surface area (3-D)

#### C. Volume

1. Prisms, pyramids, cones, and spheres
2. Truncated 3-D figures

### II. Algebraic Mechanics

#### A. Equations

1. Solving equations of degrees 2, 3, and 4
2. Solving equations involving radicals / rational exponents
3. Solving equations involving “quadratic types”
4. Solving equations using factoring and/or synthetic division
5. Solving exponential and logarithmic equations
6. Solving literal equations (i.e. solving a formula for a variable)
7. Solving absolute value equations and inequalities

#### B. Functions

1. finding zeros of functions of degree 2, 3, 4, or higher
2. finding points of intersection of algebraic and transcendental (exponential, logarithmic, trigonometric) graphs
3. determining the domain and range of piecewise and rational functions
4. determining whether a function is even, odd, or neither
5. evaluating piecewise and composite functions
6. evaluating functions in a “difference quotient” expression
7. identifying and sketching the graphs of function transformations and distortion

#### C. The Binomial Theorem

1. the meaning of factorial and combination of “n” things taken “r” at a time
2. expanding a binomial using the Binomial Theorem or Pascal’s Triangle

### **III. Precalculus Mechanics**

#### **A. Compositions and Piecewise Defined Functions**

1. mix algebraic with the transcendental and identify:
2. the domain and range
3. how to evaluate them
4. sketch the graph by hand

#### **B. Inverse Function Concepts**

1. how to form inverse relationships with ordered pairs & graphs
2. how to use compositions to verify inverses

#### **C. Polynomial Functions**

1. finding bounds on real zeros
2. finding potential rational zeros
3. finding complex zeros and writing the factorization of the polynomial
4. end behavior – “curve sketching”

#### **D. Trigonometric Functions**

1. know the unit circle and the 2 special right triangle information
2. know the Pythagorean Identities
3. know the double- angle formulas for  $\sin 2A$  and  $\cos 2A$
4. solving trigonometric equations (espec. multiple angles)
5. curve sketching of the sine, cosine, tangent, arccosine, arcsine, and arctangent graphs over one period [include “phase shifts”] by hand

#### **E. Parametric Equations (eliminate parameter & sketch graph)**

#### **F. Polar Forms**

1. convert from polar to rectangular coordinates (vice-versa)
2. identify graph given the polar equation

## SUMMER ASSIGNMENT PROBLEMS - 2009

### (I) Solve for x, where x is a real number

1.  $x^2 + 3x - 4 = 14$

2.  $\frac{x^4 - 1}{x^3} = 0$

3.  $(x - 5)^2 = 9$

4.  $2x^2 + 5x = 8$

5.  $(x + 3)(x - 3) > 0$

6.  $x^2 - 2x - 15 \leq 0$

7.  $12x^2 = 3x$

8.  $|x - 3| < 7$

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

10.  $x^6 - 16x^4 = 0$

11.  $4x^3 - 8x^2 - 25x + 50 = 0$

12.  $8x^3 + 27 = 0$

### (II) Solve for indicated variable

13.  $V = 2(ab + bc + ca)$  ; for a

14.  $A = 2\pi r^2 + 2\pi rh$  ; for positive r

15.  $2x - 2yd = y + xd$  ; for d

### (III) Solve for x

16.  $2 - (x - 3)^{1/2} = 0$

17.  $-(x + 3)^{1/2} = 12 - (x + 6)^{1/2}$

18.  $x^4 + 6x^2 + 9 = 0$

19.  $2x^{2/3} - x^{1/3} - 3 = 0$

### (IV) Solve for x, where x is a real number

20.  $27^{2x} = 9^{x-3}$

21.  $e^{3k} = 5$

22.  $\log x + \log(x-3) = 1$

23.  $\ln y = 2t-3$

(V) Answer and show your work which supports answers.

24. Which ordered pairs represent the intersection of the graphs  
 $y = -x - 6$  and  $y = x^2 + 6x$  ?
25. Find the quadratic equation whose graph fits the description of  
containing the point (0,6) and having x-intercepts 2 and -1
26. Given  $g(x) = 2\ln x$  and  $h(x) = x - 2$  :
- state the domain for  $g$
  - where does  $g(x) = h(x)$ ? (round coordinates to 3 decimals)
27. Given  $p(x) = \sin x$  and  $t(x) = x^2$  :
- state the domain for  $p$
  - where does  $p(x) = t(x)$ ? (round coordinates to 3 decimals)
28. Given  $f(x) = e^{x^2}$  and  $r(x) = (x+1)^2$  :
- state the domain for  $f$
  - state the domain for  $r$
  - where is  $r(x) < f(x)$  ? (use interval notation as needed)
29. Expand the following binomials:
- $(x+y)^3$
  - $(x-y)^4$
  - $(2x+y)^5$
30. Simplify  $\frac{f(x+h)-f(x)}{h}$  using (a)  $f(x)=2x+3$  and (b)  $f(x)=\frac{1}{x+1}$

(VI) State the domain for each function. Then state whether the function is even, odd, or neither.

31.  $f(x) = \frac{2}{x^2-1}$       32.  $f(x) = \frac{(x+1)^2}{2x^2}$       33.  $f(x) = \frac{x^3-1}{x-1}$       34.  $f(x) = \cos x$
35.  $y = \sqrt{x-4}$       36.  $y = \sqrt{(x^2-4)}$       37.  $y = \sqrt{4-x^2}$

**(VII) Evaluate**

38. If  $f(x) = x^2 + 1$  ,  $x < 0$

$$1 - x , x \geq 0$$

Find:  $f(-1)$  ,  $f(3)$  , and  $f(0)$

39. If  $f(x) = 2x+3$  and  $g(x) = -x^2$  , find :  $g(f(-2))$  and  $f(g(-2))$

40. Suppose  $h$  is a one-to-one function.

a. if  $h(-2)=4$ , find  $h^{-1}(4)$

b. if  $h(x)=a$  , find  $h^{-1}(h(x))$

41. (do not use a calculator)

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.  $\sin^{-1} \left( \frac{\sqrt{3}}{2} \right)$

**(VIII) Find the remainders on division of the following polynomials:**

42.  $x^5 - 4x^4 + x^3 - 7x + 1$  by  $x+2$

43.  $x^5 - x^4 + x^3 + 2x^2 - x + 4$  by  $x^3+1$

**(IX) Solve each trigonometric equation for  $x$**

44.  $3\sin^2x = \cos^2x$  in the interval  $[0, 2\pi]$

45.  $\cos^2x - \sin^2x = \sin x$  in the interval  $(-\pi, \pi]$

46.  $\tan x + \sec x = 2\cos x$  in the interval  $(-\infty, \infty)$

(X) Using the point-slope form  $y - y_1 = m(x - x_1)$ , write an equation for the line as described:

47. slope = -2 and contains the point (3,4)

48. containing the points (1, -3) and (-5, 2)

49. parallel to  $2x - 3y = 7$  and passes through (5, 1)

50. perpendicular to the line in #47, containing the point (3, 4)

(XI) The graph of the function  $y = f(x)$  is given to the right. Determine the graphs of the functions:

51.  $f(x+1)$

52.  $f(-x)$

53.  $|f(x)|$

54.  $f(|x|)$

