NAME: ___________________________________________  

DIRECTIONS:

- Show all work in the packet.
- This material will be collected, graded, and points awarded at the discretion of each teacher on the first day of the math class.
- A test on this material will be administered during the first week of the class.
- An additional resource for help with this packet is [http://www.khanacademy.org](http://www.khanacademy.org). It provides videos of about 10 minutes in length on hundreds of different math topics.
- Feel free to email me with questions and or concerns ttokarchik@bishopkelley.org

**Math Teachers will be available in C-1 the following dates/times if you need help.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
</tr>
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<tbody>
<tr>
<td>Wed. July 27, 2016</td>
<td>8:00 – 9:30 AM</td>
</tr>
<tr>
<td>Mon. August 1, 2016</td>
<td>8:00 – 9:30 AM</td>
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<tr>
<td>Tuesday, August 2, 2016</td>
<td>8:00 – 9:30 AM</td>
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“Contrary to common belief, the calculus is not the height of the so-called ‘higher mathematics.’ It is, in fact, only the beginning.” -Morris Kline
AP Calculus Summer Assignment

Due Date: The beginning of class on the first Monday of the school year.

The purpose of this assignment is to have you practice the mathematical skills necessary to be successful in AP Calculus. All of the skills covered in this packet are skills from Algebra 2 and Pre-Calculus. If you need to, you may use reference materials to assist you and refresh your memory (old notes, textbooks, online resources, etc.). While the graphing calculators will be used in class, there are no calculators allowed on this packet. You should be able to do everything without a calculator.

AP Calculus is a fast paced course that is taught at the college level. There is a lot of material in the curriculum that must be covered before the AP exam in May. Therefore, we cannot spend a lot of class time re-teaching prerequisite skills. This is why you have this packet. Spend some time with it and make sure you are clear on everything covered in the packet so that you will be successful in Calculus. You can also use the packet throughout the year as a review tool for those concepts as they arise. Of course, you are always encouraged to seek help from your teacher if necessary.

This assignment will be collected and graded the first Monday of the school year. Be sure to show all appropriate work to support your answers. In addition, there may be a quiz on this material during the first quarter.

Good Luck and we look forward to a great year next year!
Section 1: Algebra Review
Show all work – No credit will be given for answers missing appropriate work. No calculators.

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. \( \sqrt{a^2 + b^2} = a + b \) ______

For questions 7-15, identify the statement 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. Solve \( \ln y = kt \) for \( y \). ______

18. Factor: \( y^3 + 27 \) ______

19. Factor: \( x^2(x - 1) - 4(x - 1) \) ______

Simplify each expression.

20. \( \frac{\sqrt[2]{x}}{x^2} \) ______

21. \( \sqrt{x} \cdot \sqrt[3]{x} \cdot \sqrt[5]{x} \) ______

22. \( \frac{5 \xi + h^3 - 5x^3}{h} \) ______

23. \( \frac{3 \zeta + h^2 - 3x^2}{h} \) ______
24. \( \frac{x^2 - 1}{x(x + 1)} \)  

25. \( \frac{1 + 4}{x^2} \cdot \frac{x}{3 - \frac{1}{x}} \)  

26. \( \frac{1}{1 - 2a} - \frac{2}{1 + 2a} + \frac{6a + 2}{4a^2 - 1} \)  

27. \( \frac{a}{2x + h} - \frac{a}{2x} \)  

**Simplify, using factoring of binomial expressions. Leave answers in factored form.**

**Example:**

\[
\frac{(x + 1)^3(4x - 9) - (16x + 9)(x + 1)^2}{(x - 6)(x + 1)} = \frac{(x + 1)^2(x + 1)(4x - 9) - (16x + 9)}{(x - 6)(x + 1)}
\]
\[
= \frac{(x + 1)^2(4x^2 - 9x - 16x - 9)}{(x - 6)(x + 1)}
\]
\[
= \frac{(x + 1)^2(4x^2 - 21x - 18)}{(x - 6)(x + 1)}
\]
\[
= \frac{(x + 1)^2(x - 3)(x + 6)}{(x - 6)(x + 1)}
\]
\[
= (x + 1)(x - 3)
\]

28. \( (x - 1)^3(2x - 3) - (2x + 12)(x - 1)^2 \)  

29. \( \frac{(x - 1)^2(3x - 1) - 2(x - 1) \cdot 3}{(x - 1)^4} \)  

30. \( \frac{(x - 1)^3(2x - 3) - (4x - 1)(x - 1)^2}{(x - 1)^2(2x - 1)} \)
Simplify by rationalizing the numerator.

Example:
\[
\frac{\sqrt{x+4} - 2}{x} = \frac{\sqrt{x+4} - 2}{x} \cdot \frac{\sqrt{x+4} + 2}{\sqrt{x+4} + 2} = \frac{x+4 - 2}{x(\sqrt{x+4} + 2)} = \frac{x}{\sqrt{x+4} + 2}.
\]

31. \(\frac{\sqrt{x+9} - 3}{x}\) \hspace{1cm} 32. \(\frac{\sqrt{x+h} - \sqrt{x}}{h}\)

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

33. \(2x^4 + 3x^3 - 2x^2 = 0\) \hspace{1cm} 34. \(\frac{2x - 7}{x+1} = \frac{2x}{x+4}\)

35. \(\frac{3x+5}{(x-1)(x^4+7)} = 0\) \hspace{1cm} 36. \(\sqrt{x^2 - 9} = x - 1\)

37. \(|2x - 3| = 14\) \hspace{1cm} 38. \(x^2 - 2x - 8 < 0\)

Solve each of the systems.

39. \(x + y = 8\) \hspace{1cm} 40. \(y = x^2 - 3x\)
\(2x - y = 7\) \hspace{1cm} \(y = 2x - 6\)
Section 2: Precalculus Review

Use your knowledge of the unit circle to evaluate each of the following. Leave your answers in radical form.

41. \( \sin(30^\circ) \) _____
42. \( \cos \frac{2\pi}{3} \) _____
43. \( \tan 45^\circ \) _____

44. \( \sin \left( -\frac{\pi}{6} \right) \) _____
45. \( \tan \pi \) _____
46. \( \csc \frac{5\pi}{6} \) _____

47. \( \cos 0^\circ \) _____
48. \( \cos \frac{3\pi}{4} \) _____
49. \( \tan \frac{\pi}{6} \) _____

50. \( \cos^{-1} \left( \frac{1}{2} \right) \) _____
51. \( \sin^{-1} \left( \frac{\sqrt{2}}{2} \right) \) _____
52. \( \tan^{-1}(1) \) _____

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

53. \( \sin x = \frac{\sqrt{3}}{2} \) _________________________
54. \( \tan^2 x = 1 \) _________________________

55. \( \cos \frac{x}{2} = \frac{\sqrt{2}}{2} \) _________________________
56. \( 2\sin^2 x + \sin x - 1 = 0 \) _________________________

For each trigonometric function identify the amplitude and any horizontal or vertical shifts from the basic function.

57. \( y = \frac{1}{2} \cos \frac{x}{2} - 3 \) amplitude:_________ period:_______ vertical shift:_______

58. \( y = 2\sin(2x - \pi) \) amplitude:_________ period:_______ horizontal shift:_______

59. \( y = \tan 3x \) period:____________

Solve each exponential or logarithmic equation.

60. \( 5^x = 125 \) ____________
61. \( 8^{x+1} = 16^x \) ____________
62. \( 81^{\frac{3}{4}} = x \) ____________
63. \( \frac{2}{3} = x \) 
64. \( \log_2 32 = x \) 
65. \( \log_7 \frac{1}{9} = -2 \) 

66. \( \log_4 x = 3 \) 
67. \( \log_3 (x + 7) = \log_3 (2x - 1) \) 

**Expand each of the following using the laws of logs.**

68. \( \log_3 5x^2 \) 
69. \( \ln \frac{5x}{y^2} \) 

**Complete each of the following using trigonometric identities and formulas.**

70. \( \sin \left( \frac{\pi}{2} - x \right) = \) 
71. \( \sin^2 x + \cos^2 x = \) 
72. \( \sin 2u = \) 

73. \( \tan x = \) 
74. \( 1 + \cot^2 x = \) 
75. \( 1 - \cos^2 x = \) 

76. A right triangle has a base of 5 and a hypotenuse of 7. Find the height.

**Section 3: Graphing Review**

**Sketch the following functions. State the domain and range of each. Draw and label your own axes.**

77. \( f(x) = x \) 
78. \( f(x) = x^2 \) 

79. \( f(x) = x^3 \) 
80. \( f(x) = |x| \)
81. \( f(x) = \frac{1}{x} \) 
82. \( f(x) = \sqrt{x} \)

83. \( f(x) = e^x \) 
84. \( f(x) = \ln x \)

85. \( f(x) = \sqrt{9 - x^2} \) 
86. \( f(x) = \sin x \)

87. \( f(x) = \cos x \) 
88. \( f(x) = \tan x \)

89. \( f(x) = \csc x \) 
90. \( f(x) = \sec x \)

91. \( f(x) = \cot x \)
1. True
2. False
3. False
4. True
5. False
6. False
7. True \( \forall x \in (-\infty, \infty) \)
8. True \( \forall x \in (0, \infty) \)
9. True \( \forall x \in (-\infty, \infty) \)
10. True \( \forall x \in (-\infty, 0) \cup (1, \infty) \)
11. True \( \forall x \in [0, \infty) \)
12. True \( \forall x \in [0, \infty) \)
13. True \( \forall x \in [0, \infty) \)
14. True \( \forall x \in [-1, 0) \cup [1, \infty) \)
15. True \( \forall x \in (-\infty, \infty) \)
16. \( y' = \frac{-(y+1)}{x-1} \)
17. \( y = e^\ln \)
18. \((y+3)(y^2 - 3y + 9)\)
19. \((x-1)(x-2)(x+2)\)
20. 1
21. \( x \)
22. \(15x^2 + 15xh + 5h^2\)
23. \(6x + 3h\)
24. \(x^2(x-1)\)
25. \(\frac{(x+4)}{x(3x-1)}\)
26. \(\frac{3}{4a^2 - 1}\)
27. \(-a\)
28. \((x-1)^2(x+1)(2x-9)\)
29. \(\frac{3x^2 - 4x - 5}{(x-1)^3}\)
30. \(x - 4\)
31. \(\frac{1}{\sqrt{x+h} + \sqrt{x}}\)
32. \(x = 0, \frac{1}{2}, -2\)
33. \(x = -28\)
34. \(x = -\frac{5}{3}\)
35. \(x = 5\)
36. \(x = \frac{17}{2}, -\frac{11}{2}\)
37. \(\{x | x \in (-2, 4)\}\)
38. \((5, 3)\)
39. \((3, 0)(2, -2)\)
40. \(\frac{1}{2}\)
41. \(-\frac{1}{2}\)
42. 1
43. \(\frac{1}{2}\)
44. 0
45. 2
46. 0
47. \(\frac{\sqrt{2}}{2}\)
48. \(\frac{\sqrt{3}}{3}\)
49. \(60^\circ \text{ or } \frac{\pi}{3}\)
50. \(45^\circ \text{ or } \frac{\pi}{4}\)
51. \(45^\circ \text{ or } \frac{\pi}{4}\)
52. \(\frac{\pi}{3}, \frac{2\pi}{3}\)
53. \(\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}\)
54. \(\frac{\pi}{2}\)
56. \( \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2} \)

57. \( \frac{1}{2}, 4\pi, \text{down}3 \)

58. \( 2, \pi, \text{Right}\ \frac{\pi}{2} \)

59. \( \frac{\pi}{3} \)

60. 3

61. 3

62. 27

63. \( \frac{1}{4} \)

64. 5

65. 3

66. 64

67. \( x = 8 \)

68. \( \log_3 (5) + 2\log_3 (x) \)

69. \( \ln(5) + \ln(x) - 2\ln(y) \)

70. \( \cos(x) \)

71. 1

72. \( 2\sin(u)\cos(u) \)

73. \( \frac{\sin(x)}{\cos(x)} \)

74. \( \csc^2(x) \)

75. \( \sin^2(x) \)

76. \( 4\sqrt{6} \)

77.

78.

79.

80.

81.