



2019 – 2020

Bishop Kelley High School

Summer Math Program

Course: Honors Calculus

NAME: _____

DIRECTIONS:

- Show all work in the packet or on separate paper and put answers on answer sheet.
- **Make sure you are aware of the calculator policy for this course.**
- No matter when you have math, **this packet is due on the first day of your math class.**
- This material will be graded, and points awarded at the discretion of each teacher
- 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>. It provides videos of about 10 minutes in length on hundreds of different math topics.

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

Date	Time
Wednesday, July 24th	8-9:30am
Monday, July 29th	8-9:30am
Tuesday, July 30st	8-9:30am

Simplify the following:

1. $\frac{1}{x} + \frac{1}{y}$

2. $\frac{1}{x} + \frac{1}{x^2}$

3. $h \div \frac{x+h}{h}$

4. $\frac{\frac{1}{x} + 1}{\frac{1}{x}}$

5. $\frac{x}{\frac{x+y}{x}}$

6. $\frac{\sqrt{x-2} + \frac{5}{\sqrt{x-2}}}{x-2}$

7. $\frac{3x}{3x+y}$

8. $\frac{1}{x+h} + \frac{1}{x}$

9. $\frac{2x^3}{y^{-5}} \cdot \frac{y^2}{3x^7}$

10. $\frac{x^2 - 4x - 5}{x^2 + 2x + 1}$

11. $\frac{x-4}{4-x}$

12. $x^{\frac{1}{3}} x^{\frac{3}{5}}$

13. $\frac{\frac{1}{x} - \frac{1}{5}}{\frac{1}{x^2} - \frac{1}{25}}$

14. $\ln(5) + \ln(x^2 - 1) - \ln(x - 1)$

15. $3^{2 \log_3 5}$

Solve for y'

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

17. $3y^2 y' + 2yy' = 5y' + 2x$

18. $3x^2 yy' + 2xy^2 = 2yy'$

Factor each expression

19. $x^3 - 4x^2 - 16x + 64$

20. $x^2 - x - 12$

21. $6x^2 - x - 2$

22. $4x^3 - 19x^2 - 5x$

23. $x^3 + 9x$

24. $x^4 - 13x^2 - 30$

25. $e^{-x} - 2xe^{-x} + x^2e^{-x}$

26. $5x^3 - 40$

27. $x^3 + 27$

28. $(2x-3)^3(x+1) + (x-3)(2x-3)^2$

29. $(3x-2)^{-4}(x+3) + (x+3)^2(3x-2)^{-3}$

Solve the following equations for x analytically (use algebra techniques).

30. $x^2 + 5x - 24 = 0$

31. $x^2 - 9 = 5$

32. $x^3 - x^2 - x = 0$

33. $3x^2 - 5x - 2 = 0$

34. $(x-1)(x^2 - 11x + 30) = 0$

35. $x^2 - 4x = 0$

36. $\sqrt{x} + 1 = 41$

37. $\frac{y}{x+1} = \frac{z}{x}$

38. $\sqrt[3]{x+1} - 4 = -1$

39. $\log_5 x = 2$

40. $x^{-2} = \frac{1}{9}$

41. $\log_3 \frac{1}{81} = x$

42. $2\sqrt{x} = x - 3$

43. $\log_8 x = -1/3$

44. $\frac{8+x}{x} - 5 = 0$

45. $x^{-1} = -3$

46. $x^{\frac{4}{3}} = 81$

47. $x^2 + x - 1 = 0$

48. $\sqrt{x} = \sqrt[3]{x}$

49. $(x+3)^2 + 9 = 25$

50. $3x^2 = 6x + 24$

51. $\frac{2x-1}{(x+2)(x^2+3)} = 0$

52. $x^3 - 2x^2 - 5x + 6 = 0$

53. $\frac{x}{x+2} - \frac{2}{2x-1} = \frac{1}{5}$

54. $xy - z = z + wx - 3x$

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

56. $(2x-1)^2(x-5)^2 + (2x-1)^3(x-5) = 0$

Show that each equation is true by simplifying the following:

57. $\frac{1}{\sqrt{x} + \sqrt{y}} = \frac{\sqrt{x} - \sqrt{y}}{x - y}$

58. $\frac{\sqrt{x+h} - \sqrt{x}}{h} = \frac{1}{\sqrt{x+h} + \sqrt{x}}$

59. $\frac{x-y}{\sqrt{x} + \sqrt{y}} = \sqrt{x} - \sqrt{y}$

60. $\frac{\sqrt{x+4} - 2}{x} = \frac{1}{\sqrt{x+4} + 2}$

Write an equation of a line based on the given information:

61. Find the equation of the line that has a slope of 5 and passes through the point $(3, -4)$.
62. Find the equation of the line that passes through the points $(4, 1)$ and $(3, -2)$.
63. Find the equation of the line that passes through the point $(-2, 1)$ and is parallel to the line $4x + 2y = -1$.
64. Find the equation of the line with slope of zero and passes through the point $(-5, 1)$.
65. Find the equation of the line through $(3, -5)$ and perpendicular to the line $3x + 4y = -7$.
66. Find the equation of the line that has undefined slope and passes through the point $(4, -5)$.
67. Find the equation of the line that has an x-intercept of 5 and a y-intercept of 3.
68. Find the equation of the vertical line that passes through the point $(3, 2)$.
69. Find the equation of the horizontal line that passes through the point $(1, -7)$.

Find the x & y intercepts (be sure to write them as point(s)):

70. Find the x and y intercepts of the line that passes through the point $(3, -2)$ and is perpendicular to the line $x - 3y = 2$.
71. Find the x and y intercepts of $\frac{x^2}{4} - \frac{y^2}{9} = 1$.
72. Find the x and y intercepts of $\frac{y^2}{4} + \frac{x^2}{16} = 1$
73. Find the x and y intercepts of $x^2 + y^2 = 9$.

Sketch the following graphs. Use the included graph paper. Do not use the calculator. Do use transformations where appropriate. Plot important points.

74. $y = 3x + 1$

75. $y = (x - 3)^2 + 1$

76. $y = -2|x + 1| - 3$

77. $x = -4$

78. $y = -\sqrt{x}$

79. $y = \frac{1}{x}$

80. $y = \frac{1}{x^2}$

81. $y = (x - 2)^3$

82. $y = \log(x)$

83. $y = e^x$

84. $x^2 + y^2 = 25$

85. $y = \begin{cases} x + 1 & \text{for } x < 1 \\ x^2 & \text{for } x \geq 1 \end{cases}$

Find the domain and range of each function. Use the graphing calculator for help in finding the range. Write the answers in INTERVAL NOTATION.

86. $y = x - 1$

87. $y = \frac{1}{x}$

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

89. $y = \frac{1}{\sqrt{x^2 + x + 1}}$

90. $y = \sqrt{x - 4}$

91. $y = |x - 1| + 2$

92. $y = 2^x$

93. $y = \sqrt{x^2 - 3x - 4}$

94. $y = x^2 + 2x - 5$

95. $y = x + 3$ for $x < 2$

96. $y = x^2$ for $x > 2$

Find the inverse of each function and solve for y. Use proper notation: $f^{-1}(x)$

97. $f(x) = 3x + 5$

98. $f(x) = \sqrt{x + 1}$

99. $f(x) = x^3 + 4$

100. $f(x) = \frac{x}{x + 2}$

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

102. $f(x) = 2x^2 - 5$

Find the compositions of the function if:

$$f(x) = x^3 + 1$$

$$g(x) = x^2 - 2$$

$$j(x) = x + 3$$

103. $f(2)$

104. $f(j(x))$

105. $f(g(2))$

106. $g(g(x))$

107. $g \circ f = g(f(x))$

108. $j(g(x))$

109. $j(x^2)$

110. $f(x+h)$

111. $\frac{j(x+h) - j(x)}{h}$

112. $\frac{g(x+h) - g(x)}{h}$

Find the difference quotient, $\frac{f(x+h) - f(x)}{h}$ for the following functions:

113. $f(x) = x^2 - 2x - 3$

114. $f(x) = 8x^2 + 1$

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

Solve the simultaneous equations analytically. Check graphically.

116.
$$\begin{aligned} 2x + 3y &= 8 \\ x + 2y &= 5 \end{aligned}$$

117.
$$\begin{aligned} y &= x^2 + 2x + 9 \\ 7x + y &= 19 \end{aligned}$$

Find the intersection of the curves graphically. (Use your graphing Calculator)

118. Find the point of intersection between the lines $y = x + 1$ and $3y - x = 5$.

119. Find the points of intersection between the line $y = x + 7$ and the curve $y = x^2 + 2x + 5$. Also, sketch the area between the graphs on the included graph paper.

Solve by using similar triangles.

120. A six-foot man is standing 10 feet away from a 20-foot lamppost. What is the length of his shadow?
121. Water is dripping out of conical figure that has a diameter of 8 inches and a height of 12 inches. When the depth of the water is 8 inches, what is the radius of the water?

Describe the symmetry of the following functions. Are the functions symmetric with the x-axis, y-axis, origin, or not at all?

122. $y = x^2 + 3$

123. $y = x^3 + 1$

124. $y = |x|$

125. $y = x^3 + x$

126. $y = \sin(x)$

127. $y = \frac{1}{x}$

Find the equations for the horizontal and vertical asymptotes of each function. Use the graphing calculator to look at the graphs for #131, #132 and #133.

128. $y = \frac{1}{x-1}$

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

130. $y = \frac{x^3}{x^3 - 1}$

131. $y = \frac{x}{\sqrt{x^2 + 1}}$

132. $y = \frac{x^2 - 5x + 7}{x - 1}$

133. $y = \frac{5x^2 - 70}{x^2 + 1}$

Exponent Rules: True/False

134. $x^0 = 1$

135. $x^{-2} = \frac{1}{x^2}$

136. $\sqrt{x+y} = \sqrt{x} + \sqrt{y}$

137. $(x^5)(x^3) = x^{15}$

138. $(x^5)(y^5) = (xy)^5$

139. $(x^3)^5 = x^8$

140. $x^{5-w} = \frac{x^5}{x^w}$

141. $x^{t+5} = (x^t)^5$

142. $\sqrt{\frac{9}{4}} = \frac{3}{2}$

143. $(4x)^{\frac{1}{2}} = 2x$

144. $\sqrt{\frac{1}{x}} = x^{-1/2}$

145. $\sqrt{x^2} = x$

146. $\sqrt{x^2-1} = x-1$

147. $x^{\frac{4}{3}} = \sqrt[4]{x^3}$

148. $(x^{\frac{1}{2}} + y^{\frac{1}{2}})^2 = x + y$

149. $x^{\frac{-2}{3}} = \frac{1}{\sqrt[3]{x^2}}$

150. $e^{\ln(x^2)} = x^2$

151. $\ln(e^3) = 3$

152. $e^{2\ln(2)-\ln(5)} = \frac{4}{5}$

153. $\ln(x^2) = (\ln(x))^2$

Use the graphing calculator for this next section.

154. Find the roots of $y = x^3 + 2x^2 - 4x - 3$.

155. Find the local maximum and local minimum of the function: $y = x^3 + 2x^2 - 4x - 3$.

156. Find the point(s) of intersection for the graphs of $y = x^3 + x - 3$ and $y = 2x + 4$.

157. Find the maximum value for the graph of $f(x) = -x^4 + x - 4$.

158. On what intervals for x is $f(x)$ increasing for $f(x) = -x^4 + x - 4$.

Evaluate the following expressions without a calculator. For the inverses, use the appropriate inverse rules and give answers in radians.

159. $\sin\left(\frac{\pi}{6}\right)$

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

161. $\tan\left(\frac{5\pi}{3}\right)$

162. $\cos(0^\circ)$

163. $\cos\left(\frac{3\pi}{4}\right)$

164. $\csc\left(\frac{-5\pi}{6}\right)$

165. $\sec(\pi)$

166. $\cot\left(\frac{-\pi}{2}\right)$

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

168. $\tan\left(\frac{\pi}{2}\right)$

169. $\sin^2\left(\frac{5\pi}{6}\right)$

170. $\cot\left(\frac{2\pi}{3}\right)$

171. $\sin\left(\frac{\pi}{2}\right)$

172. $\cot^{-1}(-1)$

173. $\sec\left(\frac{3\pi}{4}\right)$

174. $\tan^{-1}(-1)$

175. $\csc(\pi)$

176. $\sec^2\left(\frac{11\pi}{6}\right)$

Solve the following trig equations for the given domain.

177. $\sin(x) = \cos(x)$ on $[0, 2\pi]$

178. $\sin(2x) = \frac{1}{2}$ on $[0, 2\pi]$

179. $\sin(3x) = \frac{\sqrt{3}}{2}$ on $[0, \pi]$

180. $\cos(4x) = \frac{-1}{2}$ on $[0, \pi]$

181. $\tan(2x) = 0$ on $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$

182. $\sec(\pi x) = 2$ on $[0, \pi]$

183. $\cot(x) = 0$ on $[0, \pi]$

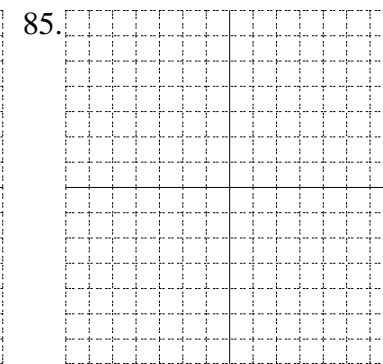
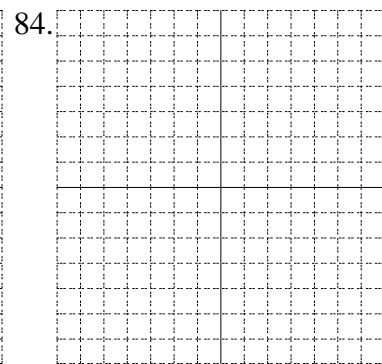
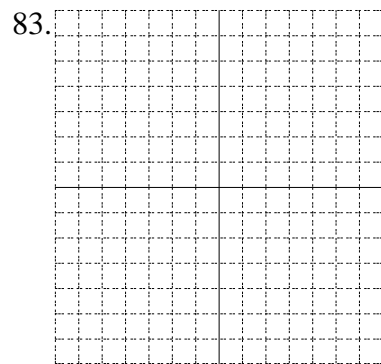
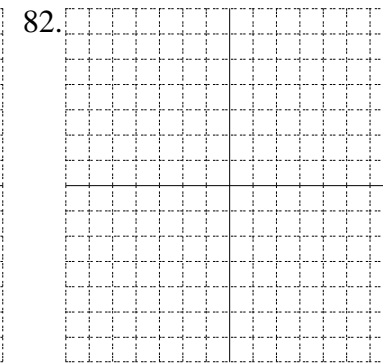
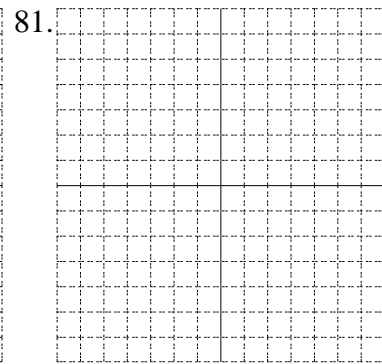
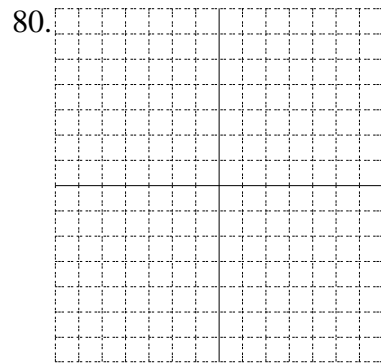
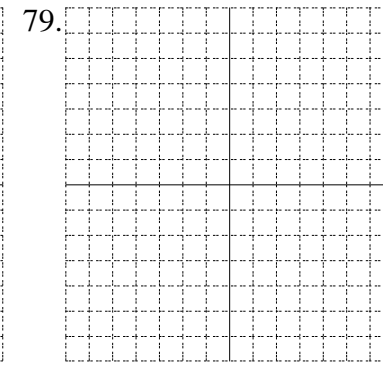
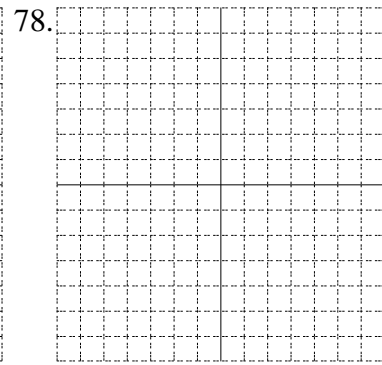
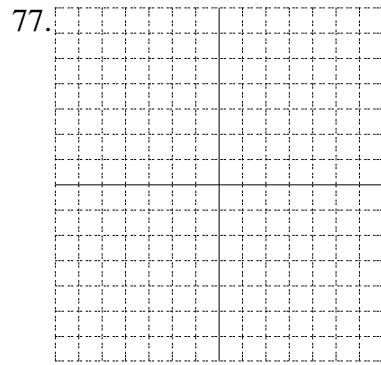
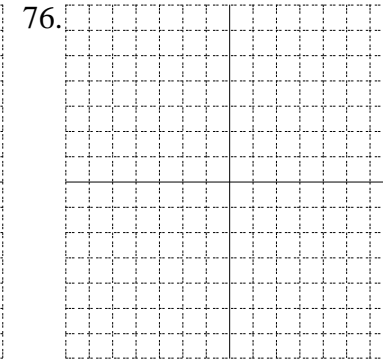
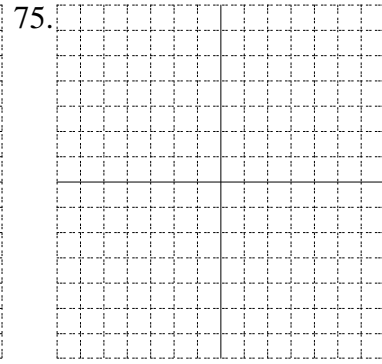
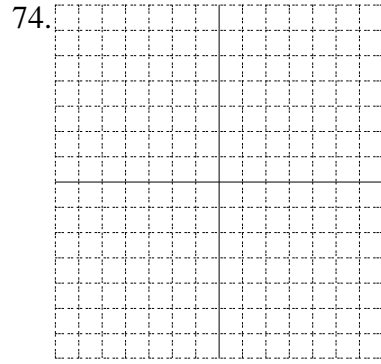
184. $2\sin(x)\cos(x) = 0$ on $[0, 2\pi]$

185. $\sin^2(x) + \sin(x) = 0$ on $[0, 2\pi]$

Summer Packet

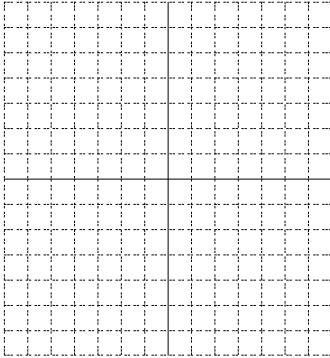
Name: _____

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
11.	12.	13.	14.	15.
16.	17.	18.	19.	20.
21.	22.	23.	24.	25.
26.	27.	28.	29.	30.
31.	32.	33.	34.	35.
36.	37.	38.	39.	40.
41.	42.	43.	44.	45.
46.	47.	48.	49.	50.
51.	52.	53.	54.	55.
56.	57.	58.	59.	60.
61.	62.	63.	64.	65.
66.	67.	68.	69.	70.
71.	72.	73.	74. See Graph Below	75. See Graphs Below



86.	87.	88.	89.	90.
91.	92.	93.	94.	95.
96.	97.	98.	99.	100.
101.	102.	103.	104.	105.
106.	107.	108.	109.	110.
111.	112.	113.	114.	115.
116.	117.	118.	119. See Graph Below	120.

119.



121.	122.	123.	124.	125.
126.	127.	128.	129.	130.
131.	132.	133.	134.	135.
136.	137.	138.	139.	140.
141.	142.	143.	144.	145.

146.	147.	148.	149.	150.
151.	152.	153.	154.	155.
156.	157.	158.	159.	160.
161.	162.	163.	164.	165.
166.	167.	168.	169.	170.
171.	172.	173.	174.	175.
176.	177.	178.	179.	180.
181.	182.	183.	184.	185.