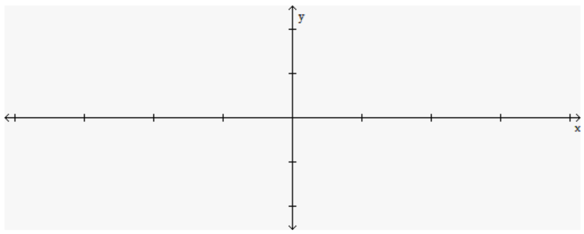
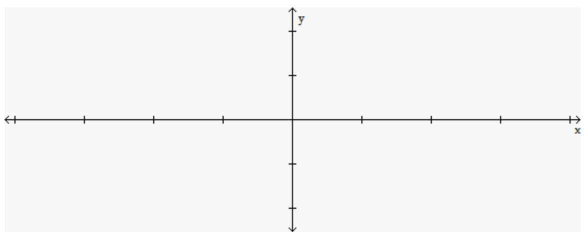
Calculus Memory Quiz BC   Name ___________________________________

1. Indicate which sides of a reference triangle are used to make the trigonometric ratios and then draw the graph using the domain of $[-2\pi, 2\pi]$.

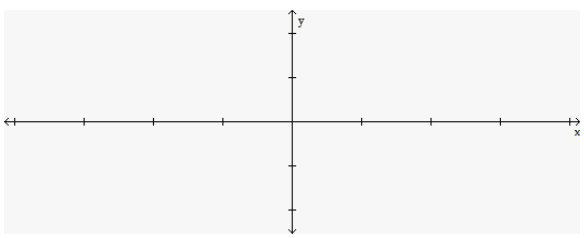
$\sin x = \text{——}$



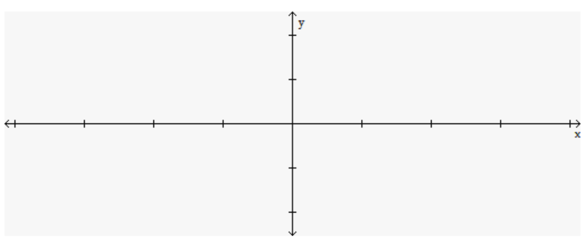
$\cos x = \text{——}$



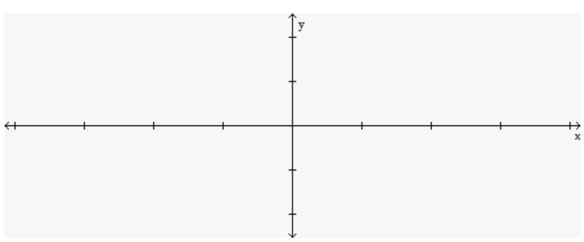
$\tan x = \text{——}$



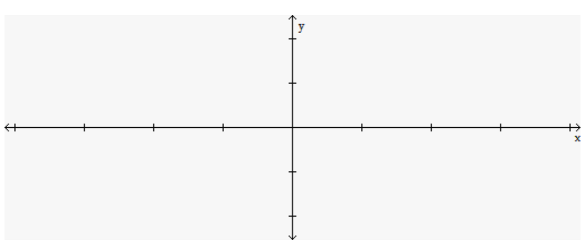
$\csc x = \text{——}$



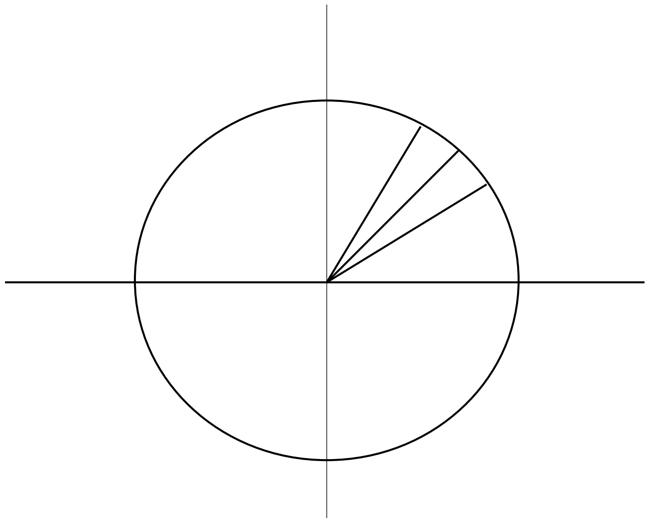
$\sec x = \text{——}$



$\cot x = \text{——}$



2. Draw the reference triangles, label the sides or coordinates on the unit circle, and complete the chart with exact values.



M°	M (radians)	*sin* θ	*cos* θ	*tan* θ	*csc* θ	*sec* θ	*cot* θ
0°							
30°							
45°							
60°							
90°							
120°							
135°							
150°							
180°							
210°							
225°							
240°							
270°							
300°							
315°							
330°							
360°							

3. For $y = A\sin(b(x-h))+k$ or $y = A\cos(b(x-h))+k$ [must be factored this way]

Period = ___________ Amplitude = _______________

Phase shift = ___________ Vertical Shift = ______________

$y = A\tan(b(x-h))+k$ Period =_________

4. $\sin^2 x + \cos^2 x$ = ________________________

(related identities) ________________________

____

5. $\sin(-\theta)$ = ____________ so, $\sin(\theta)$ is a __________ function

$\cos(-\theta)$ = ___________ so, $\cos(\theta)$ is a __________ function

$\tan(-\theta)$= ___________ so, $\tan(\theta)$ is a __________ function

6. $\sin(a \pm b) =$ ________________________

7. $\cos(a \pm b) =$ ________________________

8. $\sin 2\theta$ =____________________________

9. $\cos 2\theta$ =____________________________

____

____

10. $\sin^2 x =$ ________________________ (power reducing)

11. $\cos^2 x =$ _______________________ (power reducing)

12. tan x =______________ (in terms of sin and cos)

cot x = _____________

sec x = _____________

csc x = _____________

13. $\cos(x - \frac{\pi}{2})$=________________________

$\sin(x + \frac{\pi}{2})$=________________________

So cos and sin are _______________ shifts of one another.

14. Trig functions take ____________ and give ___________.

Inverse Trig functions take ____________ and give _________.

15. $\log_a(xy) =$ _______________________________

16. $\log_a\left(\dfrac{x}{y}\right) =$ _____________________________

17. $\log_a x^r =$ ______________________________

18. $\log_a x =$ ______________________________

19. $e^{x+y} =$ _____________

20. f(x) is continuous at x = a if:

1.____

2.____

3.____

21. Let $f(x) = ax^m + \ldots$ and $g(x) = bx^n + \ldots$

What is $\lim\limits_{x \to \pm\infty} \dfrac{f(x)}{g(x)}$

If $f(x)$ is of lower degree than $g(x)$? _____________

If $f(x)$ is of same degree than $g(x)$? _____________

If $f(x)$ is of higher degree than $g(x)$? ____________

22. Rolle's theorem:

If ___________________________________

Then ___________________________________

23. A function is even if:

1. ___________________________________ (analytic)

2. ___________________________________ (graphic)

f(x) is an odd function if

1.___________________________________ (analytic)

2.___________________________________ (graphic)

24. Horizontal asymptote: (as a limit)______________________

Vertical asymptote: (as a limit) ________________________

25. Average rate of change:_____________________

Instantaneous rate of change:_________________

26. Three formulae for the definition of a derivative: (mark your favorite one)

1. ____

2. ____

3. ____

Which definition is <u>generally</u> best when given data or graphs?

____ Why? ____________________________________

27. Extreme Value Theorem:

If : ____

Then : ____

28. To find critical points for y = f(x): (i.e. Where can max/min occur?)

1.__________________________________

2.__________________________________

3.__________________________________

29. What tests are used to find max/min values on y = f(x):

1.___________________________________

2.___________________________________

30. When finding max/min, a ___________ line can be helpful, but it must be accompanied by a verbal explanation.

31. *<u>ALWAYS</u>* ______________ the given graph or table.

32. f is increasing on [a,b] if :_____________________

f is decreasing on [a,b] if:_____________________

(note: inc/dec only applies to intervals, not points)

33. f is concave up if:___________________________

(tangent line is _______________ the curve)

f is concave down if:_________________________

(tangent line is _______________ the curve)

34. To locate points of inflection on f(x):

1.________________________________

2.________________________________

3.________________________________

35. The linear approximation near x = a: (i.e. linearization)

____

Where is a linearization a good approximation?

____

36. Describe the process for finding Riemann Sums:

1.____

2.____

3.____

37. Find the slope of the normal line to a given line y = m x + b or $y - y_1 = m(x - x_1)$ ______________

38. Speed if velocity is v(t): ________________________

39. $\frac{d}{dx}u^n =$___________________________

40. $\frac{d}{dx}(fg) =$________________________

41. $\frac{d}{dx}(\frac{f}{g}) =$_________________________

42. $\frac{d}{dx}(f(g(u)) =$_________________________

43. $\frac{d}{dx}\sin u =$___________________________

44. $\frac{d}{dx}\cos u =$___________________________

45. $\frac{d}{dx}\tan u =$___________________________

46. $\frac{d}{dx}\cot u =$___________________________

47. $\frac{d}{dx}\sec u =$ ____________________

48. $\frac{d}{dx}\csc u =$ ____________________

49. $\frac{d}{dx}e^u =$ ____________________

50. $\frac{d}{dx}a^u =$ ____________________

51. $\frac{d}{dx}\ln u =$ ____________________

52. $\frac{d}{dx}\log_a u =$ ____________________

53. $\frac{d}{dx}\arcsin u = \frac{d}{dx}\sin^{-1} u =$ ____________ w/ conditions

54. $\frac{d}{dx}\arctan u = \frac{d}{dx}\tan^{-1} u =$ ____________

55. $\frac{d}{dx}\text{arcsec}\, u = \frac{d}{dx}\sec^{-1} u =$ ____________

56. $\int u^n du =$ ____________________

57. $\int \frac{1}{u} du =$ ____________________

58. $\int e^u du =$ ____________________

59. $\int a^u du =$ ____________________

60. $\int \ln u\, du =$ ____________________

61. $\int \frac{1}{u \ln a} du$ = ____________________

62. $\int \sin u\, du =$ ____________________

63. $\int \cos u\, du =$ ____________________

64. $\int \tan u\, du =$ ____________________

65. $\int \cot u\, du =$ ____________________

66. $\int \sec u\, du =$ ____________________

67. $\int \csc u\, du =$ ____________________

68. $\int \sec^2 u\, du =$ ____________________

69. $\int \sec u \tan u\, du =$ ____________________

70. $\int \csc^2 u\, du =$ ____________________

71. $\int \csc u \cot u\, du =$ ____________________

72. $\int \tan^2 u\, du =$ ____________________

73. $\int \frac{du}{a^2+u^2} =$ ____________________

74. $\int \frac{du}{\sqrt{a^2-u^2}} =$ ____________________

75. $\int \frac{du}{|u|\sqrt{u^2-1}} =$ ____________________

76. $\int a\, dx =$ ____________________

77. $\int cf(u)du =$ __________ , $\int_a^a f(u)du =$ ______

78. What is the FTC? What does it mean? (both parts)

Part I:

Part II:

79. $\int_a^b f(u)du =$ ____________________

80. $\frac{d}{dx}\int_u^v f(t)dt =$ ____________________

81. The number e as a limit:

1.____________________

2.____________________

82. If $ax^2 + bx + c = 0$,then

$x =$ ____________________

83. Newton's Method:

$x_{n+1} =$ ____________________

84. Trapezoid Rule:

$T_n =$

____

This formula requires: ____________________

This formula is the average of: ____________________

85. If $g = f^{-1}(x)$, then $g'(f(x)) =$ ________

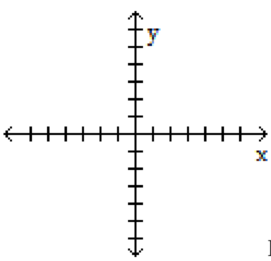
In words this is said:

____

86. f and g are inverses if: ____________________

87. f has an inverse that is a function if f is: ____________

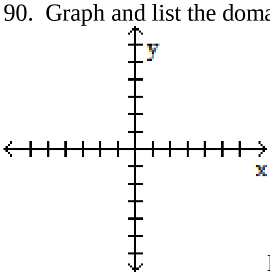
88. Graph and list domain and range of e^x :



D = __________ R = __________

89. $e^{\ln x}$ =____________ $\ln e^x$ =____________________

90. Graph and list the domain and range of ln x:



D = __________ R = __________

91. To apply L'Hopital's Rule the limit <u>must</u> be in one of the ____________ forms: ____________________

L'Hopital's Rule is: ____________________

____

92. Logarithmic limits must be used when the limit is in the forms:

____

93. Average velocity can be found two ways:

1. ____________________

2. ____________________

94. If a particle moving according to s(t), then

velocity v(t)=____________ acceleration a(t)=__________

95. If a(t) = k, then velocity v(t) = ____________________

and position s(t) = ____________________

96. If v(t) and a(t) have the same sign, then the particle's speed is ____________. If v(t) and a(t) have different signs, then the particle's speed is ____________.

97. Intermediate Value Theorem for continuous function on $[a,b]$:

If: ____________________

Then:

____

____

98. Mean Value Theorem for Derivatives: If $f(x)$ is __________ on $[a,b]$, and __________ on (a,b),

then: ____________________

____

99. Mean Value Theorem for Integrals (aka: __________ __________ Theorem) :

Symbolic Representation:

____

In words:

____

100. The area between two curves f(x) and g(x) on [a,b]:

(assume f > g) ____________________

101. Integration by parts:

$\int u\,dv =$ ____________________

What is the acronym that is used to decide the best choice for u and what does each letter stand for?

____

102. **Describe** how to find a Volume of Revolution for f(x) revolved about line y = c:
____

103. **Describe** how to find a Volume of Revolution for f(x) revolved about line x = c:

____

104. Discs: V = ____________________________________

105. Washers: V= ____________________________________

106. Shells: V = ____________________________________

107. Cross sections of area A(t), taken perpendicular to the

x-axis: Volume =__________________________________

y-axis: Volume =__________________________________

108. Given v(t),

Total distance traveled = _____________________

Net distance traveled = _____________________

Displacement is the same as ____________________

109. Exponential growth DE: _________________________

and general equation:___________________________

110. Logistic growth DE: ____________________________

and general equation:___________________________

Two important characteristics of Logistic functions:

____

____

111. Volume of: sphere:________________________________

cylinder:________________________________

cone:__________________________________

112. Given $f(x)$ and $g(x)$, what limit would you use to determine which grows faster, what are the possible results of that limit, and what would each result tell you about the rates of growth of the functions relative to each other?

____

____

____

113. $\int_a^b f(x)dx = \lim_{n\to\infty} \sum_{\_}^{\_} \_\_\_\_ \ \_\_$

114. Differential Equations can be solved graphically, analytically, and numerically:

The graphic method is called a: ___________________________

The analytic approach uses the technique of: ________________
____

The numeric approach is called _______________'s Method and uses the formula:

$x_{\_} = x_{\_} + \_\_\_\_$ and

$y_{\_} = y_{\_} + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$

115. Given $f(x)$ represents a smooth curve on [a,b], then the length of the curve from a to b is:

____

116. Given $x = f(t)$ and $y = g(t)$, then the parametric derivative

$$\frac{dy}{dx} =$$

____

and

$$\frac{d^2y}{dx^2} =$$

____

117. Given $x = f(t)$ and $y = g(t)$, then the arc length of a parametric curve is given by:

____

118. Polar coordinates (r,θ) are related to Cartesian (rectangular) coordinates (x, y) by these four equations:

____

____

____

____

119. Given $r = f(\theta)$, the formula for the area bounded by the polar graph is:

____

120. Given $r = f(\theta)$, the formula for $\frac{dy}{dx}$ is:

____

121. Given $r = f(\theta)$, the formula for the length of the polar curve (assuming the path is traced only once) is:

____

122. Dot product for vectors **u** and **v**.

1. _________________________
2. _________________________

123. Angle between vectors **u** and **v**. _____________________

124. Velocity of vector **v** in terms of unit vector.

____

125. Speed of velocity vector **v** = ________

126. What is another way to write the position vector $\mathbf{r}(t) = f(t)i + g(t)j$?

____

127. Given position vector $\mathbf{r}(t) = f(t)i + g(t)j$,

how would you find the velocity vector $\mathbf{v}(t)$?

$\frac{dr}{dt} =$ ____

128. Given the vector-valued function for position $\mathbf{r}(t) = \langle f(t), g(t) \rangle$, how do you find $\frac{dy}{dx}$?

____

129. Given the vector-valued function for position $\mathbf{r}(t) = \langle f(t), g(t) \rangle$, how do you find the equation of the tangent line at time t ?

____

130. **Series Formula Does it Converge or Diverge? When?**

Harmonic-

Geometric-

Alternating Harmonic-

p-series-

Telescoping (collapsing)

131. **Tests for series convergence(divergence): [Briefly describe the process]**

LCT-

Alternating Series

n^{th} term test for ________________

Comparison test

Integral test

Ratio Test

132. Absolute convergence means:

Conditionally convergent means:

133. A Taylor series expansion for $f(x)$ centered at $x = a$ is of the form:

A formula for the n^{th} coefficient is: ___________________

134. The Lagrange error bound for the remainder is:

____

135. Describe the process for finding the interval of convergence.

____

Don't forget to check ___________________

136. Frequently used McLaurin Series (Taylor Series at x = 0)

First few terms with general term | Sigma notation with correct index and interval of convergence

$$\frac{1}{1-x} =$$

$$\frac{1}{1+x} =$$

$$e^x =$$

$$\sin x =$$

$$\cos x =$$

$$\ln(1+x) =$$

$$\tan^{-1} x =$$

137. Describe and show how to solve the 4 Improper integrals (the 4th involves vertical asymptotes).