Name____Date______

Memory Quiz

1. $\frac{dx}{dy}(\sin u) =$ $u'cos(u)$

2. $\frac{dx}{dy}(\cos u) =$ $-u'sin(u)$

3. $\frac{dx}{dy}(\tan u) = u' \sec^2 u$

1. $\frac{dx}{dy}(\sec u) = u'sec\ (u)\ tan(u)$

4. $\frac{dx}{dy}(\cot u) = -u' \csc^2 u$

5. $\frac{dx}{dy}(\csc u) = -u'\ csc\ (u)cot(u)$

7. $\int (\sin x)dx =$ $-cos\ (x)\ + c$

8. $\int (\cos x)dx =$ $sin\ (x)\ + c$

9. $\int a^x dx = =$ $\frac{a^x}{lna}$

10. $\frac{dx}{dy}(\ln u) =$ _ $\frac{1}{u} \cdot u'$

11. $\frac{dx}{dy}(e^u) =$ __ $e^u \cdot u'$

12. $\int e^x dx =$ ____ $e^x + c$

13. What is the formula for average rate of change? $\frac{f(b)-f(a)}{b-a}$

14. How do you find the instaneous rate of change? $f'(x)$

15. What is the formula for average value of a function? $\frac{1}{b-a}\int_a^b f(x)dx$

16. Determining whether a function is increasing or decreasing is related to what derivative? 1st

17. Determining whether a function is concave up or concave down is related to what derivative? 2nd

18. State the three conditions of a function to be continuous at a point.

1) $f(c)$ is definied
2)_$\lim_{x\to c} f(x)$ exist which means $\lim_{x\to c+} f(x) = \lim_{x\to c-} f(x)$
3) $\lim_{x\to c} f(x) = f(c)$

19. Where are critical values located? $f'(c) = 0$ or $f'(x)$ is undefined

20. Where are Relative Minimums Located? $f'(c) = 0$ or $f'(x)$ is undefined **and** $f'(c)$ switches from neg to pos

21. Where are Relative Maximums located? $f'(c) = 0$ or $f'(x)$ is undefined **and** $f'(c)$ switches from pos to neg

22. Where are inflection points located? $f''(c) = 0$ or $f''(x)$ is undefined **and** $f''(c)$ switches signs

23. State the formula used to find the area between two functions.

$\int_a^b \ (f(x) - g(x))dx$ where $f(x) is\ top\ and\ g(x) is\ bottom$

23. State the formula used to find the volume based on cross sections.

$\int_a^b \ (area\ of\ cross\ section)dx$ (example square = $side^2 = f(x)^2$)

24. State the formula used to find the volume formed by discs.

$\pi \int_a^b \ (R^2)dx$ where R = top – bottom (of f(x) and line rotating around)

25. State the formula used to find the volume formed by washers. $\pi \int_a^b \ (R^2)dx \ - \ \pi \int_a^b \ (r^2)dx$

26. State the formal definition for derivative $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ or $f'(c) = \lim_{x\to c}\frac{f(x)-f(c)}{x-c}$

27. State Mean Value Theorem: Condition $f(x)$ is continuous on [a,b] and

Condition $f(x)$ is differentiable on (a,b)

Implies there exists a c in (a,b) such that $f'(c) = \frac{f(b)-f(a)}{b-a}$

28. State Rolle's Theorem. Condition $f(x)$ is continuous on [a,b] and

Condition $f(x)$ is differentiable on (a,b) and f(a)=f(b)

Implies there exists a c in (a,b) such that $f'(c) = 0$

29. The derivative of the position function is the velocity function.

30. The second derivative of the position function is the acceleration function.

31. How do you find the t in which a particle is at rest? $v(t) = 0$

32. How do you find the total distance traveled by a particle? $\int_a^b |v(t)|dt$

33. How do you find the displacement of a particle? $\int_a^b v(t)dt$

34. How do you find if a particle is speeding up or slowing down?
particle is speeding up = $v(t)$ and $a(t)$ are same sign
particle is slowing down = $v(t)$ and $a(t)$ are opposite signs

35. How do you tell if a particle is moving (left/down) or (up/right)?
particle is moving (left/down) = $v(t)$ is negative
or (up/right) = $v(t)$ is positive

36. What is the formula for speed of a function? $|v(t)|$

37. An object in motion along a line reverse direction when $v(t)$ switches signs

38. How do you find the Vertical Asymptote of a rational function? Factor, cancel holes, then set bottom = 0

39. How do you find the Horizontal Asymptote of a rational function? $\frac{f(x)}{g(x)})$ = 0 if small degree/big degree

= $\frac{leading\ coefficent}{leading\ cofficent}$ if same/same

= none of big degree/small degree

40. What is the Extreme Value Theorem? Condition $f(x)$ is continuous on [a,b]

Implies $f(x)$ must attain a max and min at least once on [a,b]

41. What is the Intermediate Value Theorem? Condition If f is cont on [a,b] and k is between f(a) and f(b)

Implies there exists at least one number c between a and b such that f(c)=k.

42. To find absolute extrema you must check which points for max/min y values
   1) end points   2) all critical points (Note for these problems make a t chart with all critical points and end points and the biggest y value is your max and smallest is your min)

43. $\frac{dx}{dy} f(g(x)) = f'(g(x)) \cdot g'(x)$

54. $\frac{dx}{dy}(a^x) = \_a^u \cdot ln(a) \cdot u'$

55. True or False: $\frac{x+y}{z} = \frac{x}{z} + \frac{y}{z}$

56. True or False: $\frac{z}{x+y} = \frac{z}{x} + \frac{z}{y}$

56. When approximating $f'(x)$, then use slope

57. When approximating $\int f(x)dx$, then use Riemann sums

58. Fill in the table

	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$
$\sin x$	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	0	1	0	-1
$\cos x$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	1	0	-1	0

59. If $f(x)$ is differentiable on (a,b) then $f(x)$ is Continuous on [a,b].

60. The 2nd Fundamental Theorm of Calculus says that $\frac{d}{dx}\int_a^u f(t)dt = f(u) \cdot u'$

61. $\lim_{x\to 0} \frac{\sin x}{x} = 1$

62. $\frac{dy}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{g(x)\cdot f'(x) - f(x)\cdot g'(x)}{(g(x))^2}$ (quotient rule)

64. $\frac{dy}{dx}(f(x) \cdot g(x)) = g(x) \cdot f'(x) + f(x) \cdot g'(x)$(product rule)

63.

f	Positive	Negative	Increasing	Decreasing	Concave Up	Concave Down
f'			Positive	Negative	Increasing	Decreasing
f''					Positive	Negative

64. $(f^{-1})'(y) = \dfrac{1}{f'(f^{-1}(y))}$

65.

L'Hospital's Rule to use must show limits **separately** and state both are continuous, like below.

First state since f(x) and g(x) are continuous

says that if $\lim_{x\to a} f(x) = 0$ and $\lim_{x\to a} g(x) = 0$. Then $\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{f'(x)}{g'(x)}$

or if if $\lim_{x\to a} f(x) = \infty$ and $\lim_{x\to a} g(x) = \infty$. Then $\lim_{x\to a} \frac{f(x)}{g(x)} = \frac{f'(x)}{g'(x)}$

66. When taking limits approaching infinity rank the following from biggest to smallest.

Polynomails $(x^n + x^{n-1} + \cdots)$ Middle Logs ($\ln x$ *or* $\log x$) Smallest Exponential (e^x *or* 8^x) Biggest

67. $\ln(1) = 0$ $\ln(e) = 1$

68. What is the point slope form of the equation of a line? $y - y_1 = m(x - x_1)$

69. Left Reiman Sum $f(x)$ decreasing results in an over estimate

70. Left Rieman Sum $f(x)$ increasing results in an under estimate

71. Right Reiman Sum $f(x)$ increasing results in an over estimate

72. Right Rieman Sum $f(x)$ decreasing results in an under estimate

73. Trapezoid Sum $f(x)$ concave up results in an over estimate

74. Trapezoid Sum $f(x)$ concave down results in an under estimate

75. Midpoint Sum $f(x)$ concave down results in an over estimate

76. Midpoint Sum $f(x)$ concave up results in an under estimate

77. $\frac{dx}{dy}(\sin^{-1} u) = \frac{u'}{\sqrt{1-u^2}}$

78. $\frac{dx}{dy}(\cos^{-1} u) = \frac{-u'}{\sqrt{1-u^2}}$

79. $\frac{dx}{dy}(\tan^{-1} u) = \frac{u'}{1+u^2}$

80. $\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\left(\frac{u}{a}\right) + c$

81. $\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\left(\frac{u}{a}\right) + c$

82.

Definition of Definite Integral

$$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{k=1}^{n} f(x_k) \cdot \frac{\Delta x}{n}, \text{ where } x_k = a + k\Delta x \text{ and } \Delta x = b - a$$

$lna + lnb = \ln(a \cdot b)$

$lna - lnb = \ln(\frac{a}{b})$

$blna = \ln(a^b)$