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MTH101 FINALTERM LATEST QUIZ SPRING 2026

1. What is the derivative of $\ln(x)$?
A) e^x
B) $1/x$ ✅
C) x
D) $1/x^2$

2. What is the derivative of e^x?
A) e^x ✅
B) xe^{x-1}
C) $\ln(x)$
D) $1/e^x$

3. Using the chain rule, the derivative of $\ln(u)$ where $u = u(x)$ is:
A) u'
B) $1/u$
C) $(1/u)\,u'$ ✅
D) $u \cdot u'$

4. What is the derivative of a^x (where $a > 0$)?
A) xa^{x-1}
B) a^x
C) $a^x \ln(a)$ ✅
D) $a^x/\ln(a)$

5. Taking the natural logarithm of both sides before differentiating is called:
A) Implicit differentiation
B) **Logarithmic differentiation** ✅
C) Chain rule
D) Power rule

6. Related rates problems study how one quantity changes with respect to:
A) Its square
B) **Another quantity (usually time)** ✅

C) The origin
D) A constant

7. A function is increasing on an interval if $f'(x)$is:
A) Zero
B) Negative
C) **Positive** ✅
D) Undefined

8. A function is decreasing on an interval if $f'(x)$is:
A) Positive
B) **Negative** ✅
C) Zero
D) One

9. If $f''(x) > 0$, the graph of $f$is:
A) Concave down
B) **Concave up** ✅
C) Linear
D) Decreasing

10. Points where $f'(x) = 0$or undefined are called:
A) Inflection points
B) **Critical points** ✅
C) Stationary points only
D) Endpoints

11. The First Derivative Test is used to determine:
A) Concavity
B) **Relative maxima and minima** ✅
C) Intercepts
D) Domain

12. An inflection point occurs where the _____ changes.
A) Slope
B) **Concavity** ✅
C) Function value
D) Interval

13. In optimization, finding the largest value means finding the:

A) Absolute minimum

B) **Absolute maximum** ✅

C) Zero

D) Inflection point

14. A rectangle with fixed perimeter has maximum area when it is a:

A) Triangle

B) Circle

C) **Square** ✅

D) Trapezoid

15. Newton's Method is used to:

A) Find area

B) **Approximate real roots of equations** ✅

C) Calculate limits

D) Prove theorems

16. Rolle's Theorem requires:

A) $f(a) \neq f(b)$

B) $f(a) = f(b)$ ✅

C) $f(x) > 0$

D) $f(x) < 0$

17. Mean Value Theorem states that:

A) $f'(c) = 0$

B) $f'(c) = \frac{f(b)-f(a)}{b-a}$ ✅

C) $f'(c) = f(a)$

D) $f'(c) = f(b)$

18. Finding a function from its derivative is called:

A) Differentiation

B) **Integration** ✅

C) Limits

D) Summation

19. The constant C in integration represents:

A) Speed of light

B) **Constant of integration** ✅
C) Intercept
D) Slope

20. $\int x^n dx =$*(for* $n \neq -1$*)*
A) nx^{n-1}
B) $\frac{x^{n+1}}{n+1} + C$ ✅
C) e^x
D) $\ln x$

21. Integration by substitution reverses which rule?
A) Product
B) Quotient
C) **Chain rule** ✅
D) Power

22. If $u = g(x)$**, then** $du =$**:**
A) $g(x)dx$
B) $g'(x)dx$ ✅
C) dx
D) $1/g(x)$

23. The symbol Σ**represents:**
A) Difference
B) **Summation** ✅
C) Multiplication
D) Integration

24. In $\sum_{k=1}^{n} a_k$**,** k**is the:**
A) Variable
B) **Index of summation** ✅
C) Exponent
D) Limit

25. Area under a curve is approximated using:
A) Circles
B) **Rectangles** ✅

C) Lines
D) Points

26. As $n \to \infty$, Riemann sums approach:
A) Zero
B) **Exact area** ✅
C) Infinity
D) Negative

27. The First Fundamental Theorem links:
A) Algebra & geometry
B) **Differentiation & integration** ✅
C) Limits only
D) Series

28. $\int_a^b f(x)dx =$:
A) $F(a) - F(b)$
B) $F(b) - F(a)$ ✅
C) $F'(b)$
D) $F(b) + F(a)$

29. Area between curves is:
A) $\int [g - f]dx$
B) $\int [f - g]dx$ ✅
C) $\int f dx + \int g dx$
D) $\int f g dx$

30. Rotating a region creates a:
A) Plane
B) **Solid of revolution** ✅
C) Rectangle
D) Triangle

31. Disk Method uses:
A) Squares
B) **Circular disks** ✅

C) Triangles
D) Spheres

32. Washer method applies when there is a:
A) Peak
B) **Hole inside** ✅
C) Square base
D) Line

33. Arc length involves:
A) Integral only
B) Derivative only
C) $\sqrt{1+(f')^2}$ ✅
D) Second derivative

34. Work by variable force is:
A) Fd
B) $\int F(x)dx$ ✅
C) $F(b)-F(a)$
D) ma

35. An improper integral has:
A) Finite bounds only
B) **Infinite limits or vertical asymptotes** ✅
C) Zero result
D) Constant function

36. A finite improper integral is said to:
A) Diverge
B) **Converge** ✅
C) Oscillate
D) Vanish

37. L'Hôpital's Rule applies to:
A) $1/1$
B) $0/0$**or** ∞/∞ ✅
C) $0/1$
D) $1/0$

38. According to L'Hôpital:
A) Multiply derivatives
B) **Divide derivatives** ✅
C) Subtract functions
D) Square limits

39. A sequence is a:
A) Set
B) **List in order** ✅
C) Product
D) Ratio

40. An infinite series is the:
A) Product
B) **Sum of sequence terms** ✅
C) Difference
D) Average

41. A geometric series converges if:
A) $|r| > 1$
B) $|r| < 1$ ✅
C) $r = 1$
D) $r = 0$

42. If $\lim a_n \neq 0$**, the series:**
A) Converges
B) **Diverges** ✅
C) Oscillates
D) Alternates

43. A Maclaurin series is centered at:
A) 1
B) **0** ✅
C) π
D) e

44. Taylor polynomials are used to:
A) Delete

B) **Approximate functions** ✅
C) Integrate
D) Reverse

45. Derivative of $\log_a x \rightarrow 1/(x \ln a)$
46. $d/dx(e^{3x}) \rightarrow 3e^{3x}$
47. $d/dx[\ln(x^2+1)] \rightarrow 2x/(x^2+1)$
48. Implicit differentiation is used when y is **not explicitly solved**
49. Concavity depends on **second derivative**
50. $\int \cos x dx = \sin x + C$
51. $\int \sin x dx = -\cos x + C$
52. Harmonic series **diverges**
53. $\sum k = n(n+1)/2$
54. $\int 1/x dx = \ln |x| + C$
55. Shell method formula $\rightarrow \int 2\pi x f(x) dx$
56. Newton's method is **iterative**
57. $e \approx$**2.718**
58. $\ln(e) =$**1**
59. $e^0 =$**1**

61. The width of each rectangle in a regular partition of $[a, b]$ is:
A) $b-a$
B) $\frac{b-a}{n}$ ✅
C) $\frac{n}{b-a}$
D) ab

62. The Midpoint Rule uses the _____ of each subinterval.
A) Left endpoint
B) Right endpoint

C) **Midpoint** ✅
D) Derivative

63. $\int_a^a f(x)\,dx$**equals:**
A) 1
B) **0** ✅
C) $f(a)$
D) Infinity

64. Reversing limits of integration changes the value to:
A) Same value
B) **Negative of original** ✅
C) Zero
D) Reciprocal

65. The area of a circle can be found by integrating its:
A) Left half
B) **Upper half** ✅
C) Lower half
D) Right half

66. Revolving a rectangle about an axis forms a:
A) Cone
B) **Cylinder** ✅
C) Sphere
D) Cube

67. Volume of a sphere of radius r**is:**
A) πr^2
B) $\frac{4}{3}\pi r^3$ ✅
C) $2\pi r$
D) r^3

68. In the shell method, the height of the shell is usually:
A) x
B) $f(x)$ ✅

C) dx
D) r

69. Average value of $f(x)$on $[a, b]$is:
A) $f'(x)$
B) $\frac{1}{b-a}\int_a^b f(x)\,dx$ ✅
C) $f(b) - f(a)$
D) 0

70. Hooke's Law is given by:
A) ma
B) kx ✅
C) $\frac{1}{2}kx^2$
D) mg

71. $\int_1^\infty \frac{1}{x}dx$**is:**
A) Convergent
B) **Divergent** ✅
C) Zero
D) One

72. $\int_1^\infty \frac{1}{x^2}dx$**is:**
A) Divergent
B) **Convergent** ✅
C) Infinite
D) Negative

73. L'Hôpital's Rule can be applied:
A) Once
B) **Repeatedly** ✅
C) Never
D) Only to constants

74. $\lim_{x\to 0} \frac{\sin x}{x} =$
A) 0

B) **1** ✅
C) ∞
D) Undefined

75. A sequence converges if its limit is:
A) Infinite
B) **Finite** ✅
C) Always zero
D) Negative

76. Sum of infinite geometric series $a + ar + ar^2 + \cdots$ is:
A) $\frac{a}{r}$
B) $\frac{a}{1-r}$ ✅
C) $\frac{1}{1-r}$
D) ar

77. A p-series converges if:
A) $p < 1$
B) $p > 1$ ✅
C) $p = 1$
D) $p = 0$

78. Integral Test compares a series with a:
A) Derivative
B) **Improper integral** ✅
C) Limit
D) Polynomial

79. Absolute convergence means the series of _____ values converges.
A) Squared
B) **Absolute** ✅
C) Negative
D) Reciprocal

80. The Taylor series of e^x at 0 is also called:
A) Power series
B) **Maclaurin series** ✅

C) Sine series
D) Finite series

81. Linear programming is used for:
A) Random decisions
B) **Optimization** ✅
C) Ignoring constraints
D) Guessing

82. The feasible region satisfies all:
A) Axes
B) **Constraints** ✅
C) Origins
D) Slopes

83. Derivative of $\sec x$ is:
A) $\tan x$
B) $\sec x \tan x$ ✅
C) $\sec^2 x$
D) $-\sec x$

84. Derivative of $\tan x$ is:
A) $\sec x$
B) $\sec^2 x$ ✅
C) $\cos x$
D) $1/x$

85. Related rates problems often use the _____ theorem.
A) Rolle's
B) **Pythagorean** ✅
C) Mean Value
D) Binomial

86. If radius increases, area is:
A) Decreasing
B) **Also increasing** ✅
C) Constant
D) Zero

87. Minimizing cost means finding:

A) Relative max

B) **Absolute minimum** ✅

C) Intercept

D) Slope

88. Newton's method is an _____ process.

A) Instant

B) **Iterative** ✅

C) Linear

D) Random

89. Antiderivative is not unique due to:

A) Variable

B) **Constant C** ✅

C) Limit

D) Sign

90. $\int \frac{1}{x} dx =$

A) x^0

B) $\ln \mid x \mid + C$ ✅

C) e^x

D) $-x^{-2}$

91. $\sum_{k=1}^{n} k =$

A) n^2

B) $\frac{n(n+1)}{2}$ ✅

C) $n(n-1)$

D) $2n$

92. $\sum_{k=1}^{n} k^2 =$

A) $\frac{n^3}{3}$

B) $\frac{n(n+1)(2n+1)}{6}$ ✅

C) $\frac{n^2(n+1)^2}{4}$

D) $n(n+1)$

93. Left Riemann sums use:

A) Width

B) **Height from left endpoint** ✅

C) Slope

D) Area

94. Second Fundamental Theorem involves the:

A) Product

B) **Derivative of integral** ✅

C) Average

D) Limit

95. Area between $x = v(y)$and $x = w(y)$is integrated w.r.t:

A) x

B) y ✅

C) t

D) z

96. Square cross-section volume uses:

A) $s(x)dx$

B) $s(x)^2dx$ ✅

C) $2s(x)dx$

D) $\pi s(x)dx$

97. Integration by parts formula is:

A) $uv - \int vdu$ ✅

B) $uv + \int vdu$

C) u/v

D) $dudv$

98. Comparison Test compares an integral with a:

A) Zero

B) **Known integral** ✅

C) Polynomial

D) Series

99. $\lim_{x\to\infty} \frac{x}{e^x} =$

A) ∞

B) **0** ✅
C) 1
D) e

100. Harmonic series is:
A) Convergent
B) **Divergent** ✅
C) Zero
D) Alternating

101. Derivative of $\csc x$: $-\csc\ x\cot\ x$ ✅
102. Derivative of $\cot x$: $-\csc^2 x$ ✅
103. Derivative of $\arccos x$: $-1/\sqrt{1-x^2}$ ✅
104. Derivative of $\arcsin x$: $1/\sqrt{1-x^2}$ ✅
105. Derivative of $\arctan x$: $1/(1+x^2)$ ✅
106. $\ln(ab) = \ln a + \ln b$ ✅
107. $\ln(a/b) = \ln a - \ln b$ ✅
108. $\ln(a^n) = n\ln a$ ✅
109. $d/dx[\ln(5x)] = 1/x$ ✅
110. $e \approx 2.718$ ✅
111. Slope of tangent at $x = a$is $f'(a)$ ✅
112. Normal line is perpendicular to tangent ✅
113. Distance formula: $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ ✅
114. Rate of distance change is velocity ✅
115. Rate of velocity change is acceleration ✅
116. Local min: f'changes − to + ✅
117. Local max: f'changes + to − ✅

118. Inflection point: $f'' = 0$or undefined ✅

119. EVT requires continuity ✅

120. $\int e^{2x}dx = \frac{1}{2}e^{2x} + C$ ✅

121. $\int x^{-2}dx = -x^{-1} + C$ ✅

122. $\int \sec^2 xdx = \tan\ x + C$ ✅

123. $\int \sec\ x\tan\ xdx = \sec\ x + C$ ✅

124. Partition divides into subintervals ✅

125. Norm = longest subinterval ✅

126. $\sum_{k=1}^{n} c = nc$ ✅

127. $\int_a^b cdx = c(b-a)$ ✅

128. Integration is linear ✅

129. Definite integral gives net area ✅

130. Odd function integral over $[-a, a]$=0 ✅

131. Even function integral = $2\int_0^a$ ✅

132. Volume of cone = $\frac{1}{3}\pi r^2 h$ ✅

133. Washer has outer radius ✅

134. Shell thickness = dxor dy ✅

135. Arc length of $y = x$from 0 to 1 = $\sqrt{2}$ ✅

136. Surface area of sphere = $4\pi r^2$ ✅

137. Work uses gravity acceleration ✅

138. $\int_0^1 1/\sqrt{x}dx$converges ✅

139. $\lim_{x\to 0}(1 - \cos\ x)/x^2 = 1/2$ ✅

140. Partial sums determine convergence ✅

141. $1/n \to 0$ ✅

142. $\sum(-1)^n$diverges ✅

143. Root Test uses nth root ✅

144. Power series converges at 0 ✅

145. Radius of convergence defines interval ✅

146. $\sin x$series → odd powers ✅

147. $\cos x$series → even powers ✅

148. Objective function is optimized ✅

149. Constraints are inequalities ✅

150. Optimal solution at vertex ✅

151. Calculus studies rates of change ✅

152. u-substitution uses inner function ✅

153. Derivative of constant = 0 ✅

154. Derivative of x=1 ✅

155. Horizontal slope = 0 ✅

156. Vertical slope undefined ✅

157. If $f' = g'$, then $f = g + C$ ✅

158. Area problem → integral calculus ✅

159. Tangent problem → differential calculus ✅

160. Antidifferentiation undoes differentiation ✅

161. Cube volume = s^3 ✅

162. Water density ≈1000 kg/m³ ✅

163. $\int \csc^2 x dx = -\cot x + C$ ✅

164. $\sum 1 = n$ ✅

165. $\ln 1 = 0$ ✅

166. $\ln e = 1$ ✅

167. $e^0 = 1$ ✅

168. $d/dx[x^e] = ex^{e-1}$ ✅

169. $d/dx[e^e] = 0$ ✅

170. Non-increasing sequence = monotonic ✅

171. Bounded monotonic sequence converges ✅

172. Conditional convergence: not absolute ✅

173. Remainder in Taylor = error ✅

174. Error → 0 as $n \to \infty$ ✅

175. $\int 2x dx = x^2 + C$ ✅

176. $\int 3x^2 dx = x^3 + C$ ✅

177. Area rectangle = base×height ✅

178. Average = sum/n ✅

179. Conformable matrices can be added ✅

180. Identity matrix has 1s on diagonal ✅

181. Transpose swaps rows & columns ✅

182. Card suits = 4 ✅

183. Cards per suit = 13 ✅

184. main() is starting point ✅

185. Preprocessor uses # ✅

186. delete frees dynamic memory ✅

187. Dangling pointer → freed memory ✅

188. Classes use encapsulation ✅

189. Constructor name = class name ✅

190. Destructor uses ~ ✅

191. Operator overloading keyword = operator ✅

192. Templates support generic programming ✅

193. cin is input stream ✅

194. cout is output stream ✅

195. setw is manipulator ✅

196. fstream handles files ✅

197. Software engineering builds quality software ✅

198. Algorithms are finite and clear ✅

199. Design recipe analyzes problem ✅

200. $P = 2x + 2y$is perimeter ✅

201. $\lim_{x\to\infty} 1/x = 0$ ✅

202. $\lim_{x\to 0^+} 1/x = \infty$ ✅

203. Power series looks like polynomial ✅

204. Maclaurin series of $\cos x$starts with 1 ✅

205. Maclaurin series of $\sin x$starts with x ✅