Answer Key for Review Packet for Exam #2

Math 12-D. Benedetto

Integrals: Compute each of the following integrals, or else show that it diverges.

1. $\displaystyle\int \frac{e^{4x}+2e^{2x}-e^{x}}{e^{2x}+1}\,dx = \boxed{\frac{e^{2x}}{2}+\frac{\ln(e^{2x}+1)}{2}-\arctan e^{x}+C}$
2. $\displaystyle\int_0^3 \frac{1}{\sqrt{9-3x}}\,dx = \boxed{2}$
3. $\displaystyle\int_1^\infty \frac{1}{3x+1}\,dx$ $\boxed{\text{Diverges}}$
4. $\displaystyle\int_3^\infty \frac{1}{(x^2+16)^{\frac{3}{2}}}\,dx = \boxed{\frac{1}{40}}$
5. $\displaystyle\int_3^\infty \frac{1}{x^2-4x+7}\,dx = \boxed{\frac{\pi}{3\sqrt{3}}}$
6. $\displaystyle\int_e^\infty \frac{1}{x(\ln x)^3}\,dx = \boxed{\frac{1}{2}}$
7. $\displaystyle\int_0^3 \frac{\arctan\sqrt{x}}{\sqrt{x}(1+x)}\,dx = \boxed{\frac{\pi^2}{9}}$
8. $\displaystyle\int_0^\infty \frac{1}{(x+2)(2x+5)}\,dx = \boxed{\ln\left(\frac{5}{4}\right)}$
9. $\displaystyle\int \frac{2x^2-2x+6}{(x-1)(x^2-2x+7)}\,dx = \boxed{\ln|x-1|+\frac{1}{2}\ln|x^2-2x+7|+\frac{2}{\sqrt{6}}\arctan\left(\frac{x-1}{\sqrt{6}}\right)+C}$
10. $\displaystyle\int_7^\infty \frac{1}{x^2-8x+19}\,dx = \boxed{\frac{\pi}{6\sqrt{3}}}$
11. $\displaystyle\int_0^1 \frac{\ln x}{\sqrt{x}}\,dx = \boxed{-4}$
12. $\displaystyle\int \frac{1}{(x+3)(3x+1)}\,dx = \boxed{-\frac{1}{8}\ln|x+3|+\frac{1}{8}\ln|3x+1|+C}$
13. $\displaystyle\int_{12}^\infty \frac{1}{x\sqrt{x-3}}\,dx = \boxed{\frac{\pi}{3\sqrt{3}}}$
14. $\displaystyle\int_2^\infty \frac{1}{x^2-2x+4}\,dx = \boxed{\frac{\pi}{3\sqrt{3}}}$
15. $\displaystyle\int \frac{1}{x^2+2x+2}\,dx = \boxed{\arctan(x+1)+C}$

16. $\displaystyle\int_1^\infty \frac{\sqrt{x}}{1+x^3}\,dx = \boxed{\frac{\pi}{6}}$

17. $\displaystyle\int_0^4 \frac{1}{(8-2x)^{\frac{1}{3}}}\,dx = \boxed{3}$

18. $\displaystyle\int \frac{1}{-x^2+2x+3}\,dx = \boxed{-\frac{1}{4}\ln|x-3| + \frac{1}{4}\ln|x+1| + C}$ or $= -\frac{1}{4}\ln\left|\frac{x-3}{x+1}\right| + C$

19. $\displaystyle\int_2^\infty \frac{1}{(x^2+4)^2}\,dx = \boxed{\frac{\pi-2}{64}}$

20. $\displaystyle\int_{-1}^1 \frac{1}{\sqrt{1-x^2}}\,dx = \boxed{\pi}$

21. $\displaystyle\int_0^1 \frac{1}{\sqrt{x}}\,dx = \boxed{2}$

22. $\displaystyle\int_0^1 \frac{1}{x}\,dx$ $\boxed{\text{Diverges}}$

23. $\displaystyle\int_1^\infty \frac{1}{x}\,dx$ $\boxed{\text{Diverges}}$

24. $\displaystyle\int_0^1 \frac{1}{x^2}\,dx$ $\boxed{\text{Diverges}}$

25. $\displaystyle\int_1^\infty \frac{1}{x^2}\,dx = \boxed{1}$

26. $\displaystyle\int_0^{\frac{\pi}{2}} \tan x\,dx$ $\boxed{\text{Diverges}}$

27. $\displaystyle\int_0^1 \frac{1-2x}{\sqrt{x-x^2}}\,dx = \boxed{0}$

28. $\displaystyle\int_0^\infty e^{-x}\,dx = \boxed{1}$

29. $\displaystyle\int_0^{\frac{\pi}{2}} \sec^2 x\,dx$ $\boxed{\text{Diverges}}$

30. $\displaystyle\int_3^4 \frac{1}{(x-4)^2}\,dx$ $\boxed{\text{Diverges}}$

31. $\displaystyle\int_1^2 \frac{1}{x\ln x}\,dx$ $\boxed{\text{Diverges}}$

32. $\displaystyle\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sec x\,dx$ $\boxed{\text{Diverges}}$

33. $\displaystyle\int_0^2 \frac{1}{(2x-1)^{\frac{2}{3}}}\,dx = \boxed{\frac{3}{2}(1+\sqrt[3]{3})}$

34. $\displaystyle\int_0^1 \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx = \boxed{2(e-1)}$

35. $\displaystyle\int_1^\infty \frac{\ln x}{x}\,dx$ $\boxed{\text{Diverges}}$

36. $\displaystyle\int_0^\infty \frac{1}{x+x^2}\,dx$ $\boxed{\text{Diverges}}$

37. $\displaystyle\int_{-\infty}^\infty \frac{x}{(x^2+4)^{\frac{3}{2}}}\,dx = \boxed{0}$

38. $\displaystyle\int_{-4}^4 \frac{1}{(x+4)^{\frac{2}{3}}}\,dx = \boxed{6}$

39. $\displaystyle\int_0^{\frac{\pi}{2}} \frac{\sin x}{(\cos x)^{\frac{4}{3}}}\,dx$ $\boxed{\text{Diverges}}$

40. $\displaystyle\int_{-\infty}^\infty |x|e^{-x^2}\,dx = \boxed{1}$

41. $\displaystyle\int \frac{2x-5}{x^2+2x+2}\,dx = \boxed{\ln|x^2+2x+2| - 7\arctan(x+1) + C}$

42. $\displaystyle\int_0^1 \frac{3x^2-1}{x^3-x}\,dx$ $\boxed{\text{Diverges}}$

43. $\displaystyle\int_0^1 \frac{1}{e^x-e^{-x}}\,dx$ $\boxed{\text{Diverges}}$

44. $\displaystyle\int_0^1 \frac{e^x}{\sqrt{e^x-1}}\,dx = \boxed{2\sqrt{e-1}}$

45. $\displaystyle\int \frac{1}{x^2+4x+5}\,dx = \boxed{\arctan(x+2)+C}$

46. $\displaystyle\int_0^\infty \sin^2 x\,dx$ $\boxed{\text{Diverges}}$

47. $\displaystyle\int_0^1 \ln x\,dx = \boxed{-1}$

48. $\displaystyle\int \frac{2x^2+3}{x(x-1)^2}\,dx = \boxed{3\ln|x| - \ln|x-1| - \frac{5}{x-1} + C}$

49. $\displaystyle\int_0^1 \frac{1}{(1-x^2)^{\frac{3}{2}}}\,dx$ $\boxed{\text{Diverges}}$

50. $\displaystyle\int_1^5 \frac{x}{\sqrt{x-1}}\,dx = \boxed{\frac{28}{3}}$

51. $\displaystyle\int_1^\infty \frac{1}{x(x^2+1)}\,dx = \boxed{\frac{\ln 2}{2}}$

52. $\int_{-\infty}^{\infty} x \sin x \, dx$ $\boxed{\text{Diverges}}$

53. $\int_{-\infty}^{\infty} \frac{1}{x^2 - 6x + 10} \, dx = \boxed{\pi}$

54. $\int_{-\infty}^{\infty} x \, dx$ $\boxed{\text{Diverges}}$

55. $\int \frac{x^4 - x^3 - x - 1}{x^3 - x^2} \, dx = \boxed{\frac{x^2}{2} + 2\ln|x| - \frac{1}{x} - 2\ln|x-1| + C}$

56. $\int_0^{\infty} \frac{x}{e^x} \, dx = \boxed{1}$

57. $\int_{-5}^{0} \frac{x}{x^2 + 4x - 5} \, dx$ $\boxed{\text{Diverges}}$

58. $\int_{-5}^{0} \frac{1}{x^2 + 4x - 5} \, dx$ $\boxed{\text{Diverges}}$

59. $\int_{-1}^{1} \frac{1}{x^3} \, dx$ $\boxed{\text{Diverges}}$

60. $\int \frac{x^5 + 2}{x^2 - 1} \, dx = \boxed{\frac{x^4}{4} + \frac{x^2}{2} + \frac{3}{2}\ln|x-1| - \frac{1}{2}\ln|x+1| + C}$

61. $\int_0^{6} \frac{1}{(x-2)^2} \, dx$ $\boxed{\text{Diverges}}$

62. $\int_0^{\infty} \frac{1}{x^2 + 3x + 2} \, dx = \boxed{\ln 2}$

63. $\int_0^{\frac{\pi}{2}} \tan^2 x \, dx$ $\boxed{\text{Diverges}}$

64. $\int_0^{2} \frac{1}{(4 - x^2)^{\frac{3}{2}}} \, dx$ $\boxed{\text{Diverges}}$

65. $\int_1^{32} \frac{1}{\sqrt[5]{x - 32}} \, dx = \boxed{-\frac{5}{4}(-31)^{\frac{4}{5}}}$

66. $\int_{-\infty}^{1} xe^{4x} \, dx = \boxed{\frac{3}{16}e^4}$

67. $\int \frac{1}{(x+1)^2(x+2)} \, dx = \boxed{\ln|x+2| - \ln|x+1| - \frac{1}{x+1} + C}$

68. $\int_0^{1} \frac{1}{x^2\sqrt{x^2 + 16}} \, dx$ $\boxed{\text{Diverges}}$

69. $\displaystyle\int \frac{4x^2+7x+6}{(x+2)(x^2+4)}\,dx = \boxed{\ln|x+2| + \frac{3}{2}\ln|x^2+4| + \frac{1}{2}\arctan\left(\frac{x}{2}\right) + C}$

70. $\displaystyle\int_1^\infty \frac{1}{x(x+1)}\,dx = \boxed{\ln 2}$

71. $\displaystyle\int_{-3}^3 \frac{1}{x(x+1)}\,dx$ $\boxed{\text{Diverges}}$

72. $\displaystyle\int_{-3}^1 \frac{1}{x^2-4}\,dx$ $\boxed{\text{Diverges}}$

73. $\displaystyle\int_0^1 \arcsin x\,dx = \boxed{\frac{\pi}{2} - 1}$ (leads to improper integral)

74. $\displaystyle\int_0^\infty \cosh x\,dx$ $\boxed{\text{Diverges}}$

75. $\displaystyle\int \frac{2x^3}{x^2+3}\,dx = \boxed{x^2 - 3\ln(x^2+3) + C}$

76. $\displaystyle\int \frac{x^2-1}{x^2+1}\,dx = \boxed{x - 2\arctan x + C}$

77. $\displaystyle\int \frac{\cos x(\sin^3 x + 7\sin x + 1)}{\sin^2 x + 1}\,dx = \boxed{\frac{\sin^2 x}{2} + 3\ln|\sin^2 x + 1| + \arctan(\sin x) + C}$

78. $\displaystyle\int \frac{x^2+5x+2}{(x+1)(x^2+1)}\,dx = \boxed{\ln(x^2+1) - \ln|x+1| + 3\arctan x + C}$

Sequences: For each of the following sequences, decide whether it converges or diverges. If it converges, compute its limit.

79. $\displaystyle\left\{\frac{1+n-7n^4}{3n^4+8x^3+9}\right\}_{n=1}^\infty = \boxed{-\frac{7}{3}}$

80. $\displaystyle\left\{\frac{2^n}{n!}\right\}_{n=1}^\infty = \boxed{0}$

81. $\displaystyle\left\{\frac{n!}{3^n}\right\}_{n=1}^\infty = \boxed{\infty}$

82. $\displaystyle\left\{\frac{\sqrt{n}}{\ln n}\right\}_{n=1}^\infty = \boxed{\infty}$

83. $\displaystyle\left\{\ln\left(\frac{3n}{n+1}\right)\right\}_{n=1}^\infty = \boxed{\ln 3}$

84. $\displaystyle\left\{\frac{n^2\sin n}{n^5+7}\right\}_{n=1}^\infty = \boxed{0}$

85. $\left\{\dfrac{1}{3n+7}\right\}_{n=1}^{\infty} = \boxed{0}$

86. $\left\{\ln(n^2-7) - \ln(3n^2+n+9)\right\}_{n=1}^{\infty} = \boxed{\ln\left(\dfrac{1}{3}\right)} = -\ln 3$

87. $\left\{\arctan(n^2+1)\right\}_{n=1}^{\infty} = \boxed{\dfrac{\pi}{2}}$

88. $\left\{e^{-2n}\right\}_{n=1}^{\infty} = \boxed{0}$

89. $\left\{\dfrac{4}{\ln n}\right\}_{n=1}^{\infty} = \boxed{0}$

90. $\left\{\dfrac{\ln n}{n}\right\}_{n=1}^{\infty} = \boxed{0}$

91. $\left\{\dfrac{\sqrt{n}}{(\ln n)^2}\right\}_{n=1}^{\infty} = \boxed{\infty}$

92. $\left\{(e^n+n)^{\frac{1}{n}}\right\}_{n=1}^{\infty} = \boxed{e}$

93. $\left\{n^{\frac{1}{n}}\right\}_{n=1}^{\infty} = \boxed{1}$

94. $\left\{\dfrac{\sin^2 n}{n^2+3}\right\}_{n=1}^{\infty} = \boxed{0}$

95. $\left\{n\cos\left(\dfrac{1}{n}\right)\right\}_{n=1}^{\infty} = \boxed{\infty}$

Series: Find the **sum** for each of the following series (all of which converge):

96. $\displaystyle\sum_{n=1}^{\infty} \frac{2^n+3^n}{6^n} = \boxed{\frac{3}{2}}$

97. $\displaystyle\sum_{n=0}^{\infty} \frac{1}{4^n} - \frac{1}{7^n} = \boxed{\frac{1}{6}}$

98. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}2^{n-1}}{3^{n+1}} = \boxed{\frac{1}{15}}$

99. $\displaystyle\sum_{n=1}^{\infty} \frac{3^{n+2}}{2^{4n-1}} = \boxed{\frac{54}{13}}$

100. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}} - \frac{1}{\sqrt{n+1}} = \boxed{1}$

101. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{3 \cdot 2^n} = \boxed{\frac{1}{9}}$

102. $\displaystyle\sum_{n=1}^{\infty} e^{\frac{1}{n}} - e^{\frac{1}{n+1}} = \boxed{e-1}$

103. $\displaystyle\sum_{n=1}^{\infty} \frac{4^n}{3^{2n-1}} = \boxed{\frac{12}{5}}$

104. $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^2+n} = \boxed{1}$

105. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n 4^n}{9^{n-1}} = \boxed{-\frac{36}{13}}$

106. $\displaystyle\sum_{n=1}^{\infty} 2^{-2n} = \boxed{\frac{1}{3}}$

More Series: Determine whether each of the following series **converge** or **diverge**. Name any convergence test(s) you use, and justify that it's legal to use them:

107. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n}$ Converges (absolutely) by Ratio Test

108. $\displaystyle\sum_{n=1}^{\infty} \frac{2n + \ln n}{n + 2010}$ Diverges by n^{th} Term Divergence Test

109. $\displaystyle\sum_{n=1}^{\infty} \frac{e^n}{n^2}$ Diverges by n^{th} Term Divergence Test

110. $\displaystyle\sum_{n=1}^{\infty} \frac{n}{(n+1)^2 - n}$ Diverges by Limit Comparison Test

111. $\displaystyle\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{n^2+1}$ Converges by Alternating Series Test

112. $\displaystyle\sum_{n=1}^{\infty} \frac{2^n n^2}{n!}$ Converges (absolutely) by Ratio Test

113. $\displaystyle\sum_{n=1}^{\infty} \frac{\ln n}{n^2}$ Converges by Integral Test or Comparison Test

114. $\displaystyle\sum_{n=1}^{\infty} \frac{n^2+1}{2n^2\sqrt{n}+9}$ Diverges by Limit Comparison Test

115. $\sum_{n=1}^{\infty} \frac{\sqrt{n}+3}{4n^2-2}$ Converges by Limit Comparison Test

116. $\sum_{n=1}^{\infty} \frac{n^{19}+40n^6+4n^3+19}{4+17n^5+n^{20}}$ Diverges by Limit Comparison Test

117. $\sum_{n=1}^{\infty} \frac{\sin n}{n(\sqrt{n}+1)}$ Converges by Absolute Convergence Test

118. $\sum_{n=1}^{\infty} \frac{n^n}{2^n n!}$ Diverges by Ratio Test

119. $\sum_{n=1}^{\infty} \frac{1}{n(\ln 2)^n}$ Diverges by Ratio Test

120. $\sum_{n=2}^{\infty} \frac{1}{(\ln n)^2}$ Diverges by Comparison Test

121. $\sum_{n=1}^{\infty} \frac{\ln n}{e^n}$ Converges (absolutely) by Ratio Test

122. $\sum_{n=1}^{\infty} \frac{1}{n \ln n}$ Diverges by Integral Test

123. $\sum_{n=1}^{\infty} \frac{(-1)^n n}{3n+2}$ Diverges by n^{th} Term Divergence Test

124. $\sum_{n=1}^{\infty} \frac{3^n}{n!}$ Converges (absolutely) by Ratio Test

125. $\sum_{n=1}^{\infty} ne^{-n^2}$ Converges (absolutely) by Ratio Test or Integral Test

126. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n}{\ln n}$ Diverges by n^{th} Term Divergence Test

127. $\sum_{n=1}^{\infty} \frac{n!}{10^{4n}}$ Diverges by Ratio Test

128. $\sum_{n=1}^{\infty} \frac{1}{n^{\frac{7}{8}}}$ Diverges by p-Test, p-series with $p = \frac{7}{8} < 1$

129. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+1}}$ Diverges by Limit Comparison Test

130. $\sum_{n=1}^{\infty} e^{-2n}$ Converges as Geometric Series with $|r| = \frac{1}{e^2} < 1$ or by Ratio Test

131. $\sum_{n=1}^{\infty} \frac{1+3n^3}{n^5}$ Converges by Limit Comparison Test

132. $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{(\ln n)^2}$ Diverges by Comparison Test or n^{th} Term Divergence Test

133. $\sum_{n=1}^{\infty} \frac{2^n}{n!}$ Converges (absolutely) by Ratio Test

134. $\sum_{n=1}^{\infty} \frac{1}{n(\ln n)^7}$ Converges by Integral Test

135. $\sum_{n=1}^{\infty} \frac{\arctan n}{1+n^2}$ Converges by Comparison Test or Integral Test

136. $\sum_{n=1}^{\infty} \frac{2+\sin n}{n^2}$ Converges by Comparison Test

137. $\sum_{n=1}^{\infty} \frac{n^7}{e^n}$ Converges (absolutely) by Ratio Test

138. $\sum_{n=1}^{\infty} \frac{n!}{3^n}$ Diverges by Ratio Test

139. $\sum_{n=1}^{\infty} \frac{2n+5}{5n^3+3n^2}$ Converges by Limit Comparison Test

140. $\sum_{n=1}^{\infty} (e^n+n)^{\frac{1}{n}}$ Diverges by n^{th} Term Divergence Test

141. $\sum_{n=1}^{\infty} \frac{n^n}{n!}$ Diverges by Ratio Test or n^{th} Term Divergence Test

142. $\sum_{n=1}^{\infty} n^{\frac{1}{n}}$ Diverges by n^{th} Term Divergence Test

143. $\sum_{n=1}^{\infty} \frac{\ln n}{n}$ Diverges by Comparison Test or Integral Test

144. $\sum_{n=1}^{\infty} \frac{n \sin^2 n}{n^3+3}$ TYPO HERE! CHANGED n^2+3 to n^3+3 Converges by Comparison Test

145. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2}$ Converges by Absolute Convergence Test or by AST

146. $\sum_{n=1}^{\infty} \frac{5^n}{n^2}$ Diverges by n^{th} Term Divergence Test

147. $\sum_{n=1}^{\infty} \frac{1}{n+7}$ Diverges by Limit Comparison Test or Integral Test

148. $\sum_{n=1}^{\infty} \frac{5^n}{2^n+3^n}$ Diverges by n^{th} Term Divergence Test or LCT

149. $\sum_{n=1}^{\infty} \frac{1}{n\sqrt{\ln n}}$ Diverges by Integral Test

150. $\sum_{n=1}^{\infty} \frac{5 \cdot 2^n + 6^n}{n2^n}$ Diverges by Comparison Test

151. $\sum_{n=1}^{\infty} \frac{n^2-1}{3n^2+1}$ Diverges by n^{th} Term Divergence Test

152. $\sum_{n=1}^{\infty} \frac{7}{25+n^2}$ Converges by Comparison Test or Integral Test

153. $\sum_{n=1}^{\infty} \frac{2^n n!}{n^n}$ Converges (absolutely) by Ratio Test

154. $\sum_{n=1}^{\infty} \frac{(3n)! + 4^{n+1}}{(3n+1)!}$ Diverges by Comparison Test

155. $\sum_{n=1}^{\infty} ne^{-n}$ Converges (absolutely) by Ratio Test

156. $\sum_{n=1}^{\infty} \pi^{-n} e^n$ Converges as a Geometric Series with $|r| = \frac{e}{\pi} < 1$

157. $\sum_{n=1}^{\infty} \frac{n!}{(2n-1)!}$ Converges (absolutely) by Ratio Test

158. $\sum_{n=1}^{\infty} 3 + \frac{1}{3^n}$ Diverges by n^{th} Term Divergence Test

159. $\sum_{n=1}^{\infty} \frac{n!}{n^n}$ Converges (absolutely) by Ratio Test

160. $\sum_{n=1}^{\infty} e^{\frac{1}{n}}$ Diverges by n^{th} Term Divergence Test

161. $\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$ Converges (absolutely) by Ratio Test

162. $\sum_{n=1}^{\infty} \frac{3}{n^3 7^n}$ Converges by Comparison Test

163. $\sum_{n=1}^{\infty} \frac{2^n n}{(n+1)^2}$ Diverges by Ratio Test

164. $\sum_{n=1}^{\infty} \frac{2^n n^2}{(n+1)!}$ Converges (absolutely) by Ratio Test

165. $\sum_{n=1}^{\infty} \frac{5^n}{n!}$ Converges (absolutely) by Ratio Test

166. $\sum_{n=1}^{\infty} \frac{n!}{5^n}$ Diverges by Ratio Test

167. $\sum_{n=2}^{\infty} \left(-\frac{3}{4}\right)^n$ Converges as a Geometric Series with $|r| = |-\frac{3}{4}| = \frac{3}{4} < 1$

168. $\sum_{n=1}^{\infty} \cos(\pi n) = \sum_{n=1}^{\infty} (-1)^n$ Diverges by n^{th} Term Divergence Test

169. $\sum_{n=2}^{\infty} e^{\left(\frac{\sin n}{n}\right)}$ Diverges by n^{th} Term Divergence Test

170. $\sum_{n=2}^{\infty} \frac{9^n}{(-2)^{n+1} n}$ Diverges by Ratio Test

171. $\sum_{n=2}^{\infty} \frac{3 \cdot 7^n - n^6}{n^7 7^n}$ Converges because it's a difference of 2 conv. series

172. $\sum_{n=1}^{\infty} \frac{(2n)^n n!}{(2n)!}$ Diverges by Ratio Test

173. $\sum_{n=1}^{\infty} \frac{4^n (n!)^3}{(2n)! n^n}$ Converges (absolutely) by Ratio Test

Even More Series: Determine whether each of the following series **converges absolutely**, **converges conditionally**, or **diverges**. Justify your answers.

174. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{5n}$ Conditionally Convergent by AST

175. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{n}{2^n}$ Absolutely Convergent by Ratio Test

176. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{7n-3}$ Conditionally Convergent by AST

177. $\sum_{n=1}^{\infty}(-1)^n \frac{1}{n \ln n}$ Conditionally Convergent by AST

178. $\sum_{n=1}^{\infty}(-1)^{n+1} \frac{1}{\ln(n+1)}$ Conditionally Convergent by AST

179. $\sum_{n=1}^{\infty}(-1)^{n-1} \frac{2^n}{n+3^n}$ Absolutely Convergent by Absolute Convergence Test or Ratio Test

180. $\sum_{n=1}^{\infty}(-1)^{n+1} \frac{n}{10n+1}$ Diverges by n^{th} Term Divergence Test

181. $\sum_{n=1}^{\infty}(-1)^{n+1} \frac{n}{n^2+1}$ Conditionally Convergent by AST

182. $\sum_{n=1}^{\infty} \frac{\cos(\pi n)}{n}$ Conditionally Convergent by AST

183. $\sum_{n=1}^{\infty}(-1)^n \frac{\ln n}{n}$ Conditionally Convergent by AST

184. $\sum_{n=1}^{\infty}(-1)^n \frac{1}{\cosh n}$ Absolutely Convergent by Ratio Test

185. $\sum_{n=1}^{\infty}(-1)^{n+1} \frac{n!}{2^{n^2}}$ Absolutely Convergent by Ratio Test

186. $\sum_{n=2}^{\infty} \frac{n(-3)^{2n+1}}{10^n}$ Absolutely Convergent by Ratio Test

187. $\sum_{n=2}^{\infty} 2^{\ln n} \left(\frac{1}{2}\right)^n$ Absolutely Convergent by Ratio Test

188. $\sum_{n=1}^{\infty} \frac{7^n}{n^n}$ Absolutely Convergent by Ratio Test

189. $\sum_{n=1}^{\infty} \frac{(-2)^n}{n+3^n}$ Absolutely Convergent by Absolute Convergence Test or by Ratio Test

190. $\sum_{n=1}^{\infty} \frac{e^{2n}}{n^n}$ Absolutely Convergent by Ratio Test

191. $\sum_{n=1}^{\infty} \frac{(-4)^{2n+1}}{n10^n}$ Diverges by Ratio Test

192. $\sum_{n=1}^{\infty}(-1)^n \frac{\ln(n^2)}{n^3}$ Absolutely Convergent by Absolute Convergence Test

193. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{\arctan n}{n+2^n}$ Absolutely Convergent by Absolute Convergence Test

194. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{1}{n(n+1)}$ Absolutely Convergent by Absolute Convergence Test

195. $\sum_{n=1}^{\infty}\frac{(n+2)!}{3^n(n!)^2}$ Absolutely Convergent by Ratio Test