**Answer Key for Review Packet for Exam #1**

Math 12-D. Benedetto

**Derivatives:** Compute the derivative for each of the following functions. Do not worry about simplifying your answers:

1. $f(x) = \sinh^{-1}(\ln(\cos^3 x))$

   $f'(x) = \dfrac{1}{\sqrt{1+(\ln(\cos^3 x))^2}} \cdot \dfrac{1}{\cos^3 x} \cdot 3\cos x \cdot (-\sin x)$

2. $f(x) = \dfrac{\cosh(\sqrt{x})}{5e^{2x}}$

   $f'(x) = \dfrac{5e^{2x} \cdot \sinh(\sqrt{x}) \cdot \dfrac{1}{2\sqrt{x}} - \cosh\sqrt{x} \cdot 5e^{2x} \cdot 2}{25e^{4x}}$

3. $f(x) = \dfrac{1}{\arctan(17x)}$

   $f'(x) = -\dfrac{1}{(\arctan(17x))^2} \cdot \dfrac{1}{1+(17x)^2} \cdot 17$

4. $f(x) = 3(\cosh x)e^{\tan x}$

   $f'(x) = 3\cosh x \cdot e^{\tan x} \cdot (\sec^2 x) + e^{\tan x} \cdot 3\sinh x$

5. $f(x) = \sin(4x)\cos(4x) + 2\sin^{-1}(4+x)$

   $f'(x) = \sin(4x)(-\sin(4x)\cdot 4) + \cos(4x)\cdot\cos(4x)\cdot 4 + 2\cdot\dfrac{1}{\sqrt{1-(4+x)^2}}$

6. $f(x) = e^{5x}\cos^{-1}(5x)$

   $f'(x) = e^{5x}\cdot\left(\dfrac{-1}{\sqrt{1-(5x)^2}}\right)\cdot 5 + \cos^{-1}(5x)\cdot e^{5x}\cdot 5$

7. $f(x) = \dfrac{e^{\sinh x}}{\sqrt{1-9x^2}}$

   $f'(x) = \dfrac{\sqrt{1-9x^2}\cdot e^{\sinh x}\cdot\cosh x - e^{\sinh x}\cdot\dfrac{1}{2\sqrt{1-9x^2}}\cdot(-18x)}{(1-9x^2)}$

8. $f(x) = \dfrac{\sqrt{x^2+4}}{\arcsin(3x)}$

   $f'(x) = \dfrac{\arcsin(3x)\cdot\dfrac{1}{2\sqrt{x^2+4}}\cdot(2x) - \sqrt{x^2+4}\cdot\dfrac{1}{\sqrt{1-(3x)^2}}\cdot 3}{(\arcsin(3x))^2}$

9. $f(x) = \sinh^{-1}\left(\dfrac{e^{\sin x}}{x-7}\right)$

$$f'(x) = \frac{1}{\sqrt{1+\left(\dfrac{e^{\sin x}}{x-7}\right)^2}} \cdot \left(\frac{(x-7)e^{\sin x}\cdot\cos x - e^{\sin x}}{(x-7)^2}\right)$$

10. $f(x) = e^{\cosh\left(\frac{1}{\arcsin(7x)}\right)}$

$$f'(x) = e^{\cosh\left(\frac{1}{\arcsin(7x)}\right)} \cdot \sinh\left(\frac{1}{\arcsin(7x)}\right) \cdot \left(\frac{-1}{(\arcsin(7x))^2}\right) \cdot \frac{1}{\sqrt{1-(7x)^2}} \cdot 7$$

11. $f(x) = \sinh(\arcsin x)$

$$f'(x) = \cosh(\arcsin x) \cdot \frac{1}{\sqrt{1-x^2}}$$

12. $f(x) = \sinh\left(e^{\cosh(2x)}\right)$

$$f'(x) = \cosh\left(e^{\cosh(2x)}\right) \cdot e^{\cosh(2x)} \cdot \sinh(2x) \cdot 2$$

13. $f(x) = \arcsin x \cdot \arctan x$

$$f'(x) = \arcsin x \cdot \frac{1}{1+x^2} + \arctan x \cdot \frac{1}{\sqrt{1-x^2}}$$

14. $f(x) = \arctan(\sin(\ln x))$

$$f'(x) = \frac{1}{1+(\sin(\ln x))^2} \cdot \cos(\ln x) \cdot \frac{1}{x}$$

15. $f(x) = \dfrac{4}{\sqrt{\ln^2 x - 1}}$

$$f'(x) = 4 \cdot \left(-\frac{1}{2}\right)\left(\ln^2 x - 1\right)^{-\frac{3}{2}} \cdot 2\ln x \cdot \frac{1}{x}$$

16. $f(x) = \dfrac{\tan^{-1}(x+3)}{\ln|x|}$

$$f'(x) = \frac{\ln|x| \cdot \dfrac{1}{1+(x+3)^2} - \arctan(x+3)\cdot\dfrac{1}{x}}{(\ln|x|)^2}$$

17. $f(x) = \ln(\arccos(x^3))$

$$f'(x) = \frac{1}{\arccos(x^3)} \cdot \left(\frac{-1}{\sqrt{1-(x^3)^2}}\right) \cdot 3x^2$$

18. $f(x) = \dfrac{\arccos x}{\cosh(x-1)}$

$$f'(x) = \frac{\cosh(x-1)\cdot\left(\dfrac{-1}{\sqrt{1-x^2}}\right) - \arccos x \cdot \sinh(x-1)}{(\cosh(x-1))^2}$$

19. $f(x) = \dfrac{\sinh x}{(x-3)^2}$

$$f'(x) = \frac{(x-3)^2 \cdot \cosh x - \sinh x \cdot 2(x-3)}{(x-3)^4}$$

20. $f(x) = \dfrac{\sinh x}{x^2 + \cosh x + 3}$

$$f'(x) = \frac{(x^2 + \cosh x + 3) \cdot \cosh x - \sinh x \cdot (2x + \sinh x)}{(x^2 + \cosh x + 3)^2}$$

21. $f(x) = \dfrac{\sinh(3x)}{\cosh(4x)}$

$$f'(x) = \frac{\cosh(4x) \cdot \cosh(3x) \cdot 3 - \sinh(3x) \cdot \sinh(4x) \cdot 4}{(\cosh(4x))^2}$$

22. $f(x) = \cosh^{-1}(3x+4)$

$$f'(x) = \frac{1}{\sqrt{(3x+4)^2 - 1}} \cdot 3$$

23. $f(x) = \dfrac{\arctan(x+2)}{\sec^2 x}$

$$f'(x) = \frac{\sec^2 x \cdot \dfrac{1}{(x+2)^2+1} - \arctan(x+2) \cdot 2\sec x \cdot \sec x \tan x}{\sec^4 x}$$

24. $f(x) = \arctan\left(\dfrac{x^2}{\sqrt{3x+1}}\right)$

$$f'(x) = \frac{1}{\left(\left(\dfrac{x^2}{\sqrt{3x+1}}\right)^2 + 1\right)} \cdot \frac{\sqrt{3x+1} \cdot 2x - x^2 \cdot \dfrac{1}{2\sqrt{3x+1}} \cdot 3}{3x+1}$$

25. $f(x) = \dfrac{\sinh(x^2-2)}{x + \sin^{-1} x}$

$$f'(x) = \frac{(x + \sin^{-1} x) \cdot \cosh(x^2-2) \cdot (2x) - \sinh(x^2-2) \cdot \left(1 + \dfrac{1}{\sqrt{1-x^2}}\right)}{(x + \sin^{-1} x)^2}$$

26. $f(x) = \dfrac{5\sinh x \tanh x}{\cosh x}$

$$f'(x) = \frac{\cosh x(5\sinh x \cdot \operatorname{sech}^2 x + \tanh x \cdot 5\cosh x) - 5\sinh x \tanh x \cdot (\sinh x)}{\cosh^2 x}$$

27. $f(x) = \dfrac{\sec(5x^2)}{\arctan\left(\frac{x}{3}\right)}$

$$f'(x) = \frac{\arctan\left(\dfrac{x}{3}\right) \cdot \sec(5x^2)\tan(5x^2) \cdot (10x) - \sec(5x^2) \cdot \left(\dfrac{1}{\left(\frac{x}{3}\right)^2 + 1}\right) \cdot \left(\dfrac{1}{3}\right)}{\left(\arctan\left(\frac{x}{3}\right)\right)^2}$$

28. $f(x) = \dfrac{\arctan(5x)}{\tanh(10x-1)}$

$$f'(x) = \frac{\tanh(10x-1)\cdot\left(\dfrac{1}{(5x)^2+1}\right)\cdot 5 - \arctan(5x)\cdot\operatorname{sech}^2(10x-1)\cdot(10)}{(\tanh(10x-1))^2}$$

29. $f(x) = \sec^{-1}(3x)$

$$f'(x) = \left(\frac{1}{(3x)\sqrt{(3x)^2-1}}\right)\cdot 3$$

30. $f(x) = \tanh^{-1}\left(\dfrac{1}{\cos x}\right)$

First, can rewrite $f(x) = \tanh^{-1}(\sec x)$

$$f'(x) = \left(\frac{1}{1-(\sec x)^2}\right)\cdot \sec x \tan x$$

31. $f(x) = \cosh\left(e^{\arccos e^x}\right)$

$$f'(x) = \sinh\left(e^{\arccos e^x}\right)\cdot e^{\arccos e^x}\left(\frac{-1}{\sqrt{1-(e^x)^2}}\right)\cdot e^x$$

**Limits:** Compute each of the following limit.

32. $\displaystyle\lim_{x\to 1}\frac{5x-5}{\ln x\cdot\cos x} = \frac{5}{\cos 1}$

33. $\displaystyle\lim_{x\to 0}\frac{\sin(3x)}{9\cos x - 5x - 9} = -\frac{3}{5}$

34. $\displaystyle\lim_{x\to 1}\frac{\cos\left(\dfrac{\pi}{2}x\right)}{x^2-x} = -\frac{\pi}{2}$

35. $\displaystyle\lim_{x\to 3}\frac{\sin(x-3)}{x^2-9} = \frac{1}{6}$

36. $\displaystyle\lim_{x\to\infty}\frac{5x^2+7x}{3x^2+x} = \frac{5}{3}$

37. $\displaystyle\lim_{x\to\infty}\frac{x^2-3x}{e^x-e^{-x}} = 0$

38. $\displaystyle\lim_{x\to 0}(1-\sin(2x))^{\frac{1}{x}} = e^{-2}$

39. $\displaystyle\lim_{x\to 3}\frac{x^2-9}{3-x} = -6$

40. $\displaystyle\lim_{x\to 0^+}\left(\frac{1}{e^x-1}-\frac{1}{x}\right) = -\frac{1}{2}$

41. $\displaystyle\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x = e$

42. $\lim_{x\to 0} \dfrac{e^x - 1}{\ln(x+1)} = e^0 = 1$

43. $\lim_{x\to \frac{\pi}{2}} \dfrac{\tan x}{1 + \tan x} = 1$

44. $\lim_{x\to 1} \dfrac{\ln x}{x^3 - 1} = \dfrac{1}{3}$

45. $\lim_{x\to \infty} \dfrac{\arctan x}{x} = 0$

46. $\lim_{x\to 0^+} x^3 \ln x = 0$

47. $\lim_{x\to 0^+} x \ln x = 0$

48. $\lim_{x\to 0} \dfrac{e^{2x} - e^x}{\sin(3x)} = \dfrac{1}{3}$

49. $\lim_{x\to 0} \dfrac{\sinh x}{3x} = \dfrac{1}{3}$

50. $\lim_{x\to 2} \dfrac{x - 2 + \sin(x-2)}{x^2 - 6x + 8} = -1$

51. $\lim_{x\to 0} \dfrac{x \sin x}{\cos x - 1} = -2$

52. $\lim_{x\to 0} x^{\sin x} = e^0 = 1$

53. $\lim_{x\to 0^+} (\cos x)^{\frac{1}{x}} = e^0 = 1$

54. $\lim_{x\to \frac{\pi}{2}^+} \dfrac{\cos x}{1 - \sin x} = -\infty$

55. $\lim_{x\to 0^+} x \ln\left(\dfrac{1}{x}\right) = 0$

56. $\lim_{x\to 0^+} x e^{\frac{1}{x}} = +\infty$

57. $\lim_{x\to 0^-} x e^{\frac{1}{x}} = 0$

58. $\lim_{x\to 1} \dfrac{3\cos(1-x) - 3x}{\sin(1-x)} = 3$

59. $\lim_{x\to \infty} \dfrac{e^x}{\ln x} = +\infty$

60. $\lim_{x\to \infty} x^{\frac{1}{x^2}} = e^0 = 1$

61. $\lim_{x\to 0^+} \dfrac{\ln x - 1}{\arcsin x} = -\infty$

62. $\lim_{x\to 0} \dfrac{x}{\tan x} = 1$

63. $\lim_{x\to 1^+} x^{\frac{1}{x-1}} = e$

64. $\lim_{x\to \pi} \dfrac{\cos x \sin x}{x-\pi} = 1$

65. $\lim_{x\to \frac{\pi}{2}^-} \tan x - \sec x = 0$

66. $\lim_{x\to 0^+} (1-2x)^{\frac{1}{x}} = e^{-2}$

67. $\lim_{x\to \infty} (x^2+1)^{\frac{1}{\ln x}} = e^2$

68. $\lim_{x\to \infty} (e^x+1)^{\frac{1}{x}} = e$

69. $\lim_{x\to \infty} \left(\cos \dfrac{1}{x}\right)^x = e^0 = 1$

70. $\lim_{x\to \infty} \left(x^3+1\right)^{\frac{1}{\ln x}} = e^3$

71. $\lim_{x\to 0^+} \dfrac{1}{\ln(x+1)} - \dfrac{1}{x} = \dfrac{1}{2}$

72. $\lim_{x\to 1^+} \dfrac{1}{\ln x} - \dfrac{x}{x-1} = -\dfrac{1}{2}$

73. $\lim_{x\to 0^+} (1+\sinh x)^{\frac{1}{\sqrt{x}}} = e^0 = 1$

74. $\lim_{x\to \infty} x^2 \sin\left(\dfrac{1}{x^2}\right) = 1$

75. $\lim_{x\to 0^+} \sqrt{x} \ln x = 0$

76. $\lim_{x\to 1} \dfrac{e^{x^2} - e^x}{\ln x} = e^1 = e$

77. $\lim_{x\to 0} (1+3x)^{\frac{2}{x}} = e^6$

78. $\lim_{x\to \infty} x(2e^{\frac{1}{x}} - 2) = 2e^0 = 2$

79. $\lim_{x\to \infty} \left(1 - \dfrac{3}{x}\right)^{4x} = e^{-12}$

80. $\lim_{x\to 0^+} (\cos x)^{\frac{1}{x^2}} = e^{-\frac{1}{2}}$

81. $\lim_{x\to 0^+} (\cos \sqrt{x})^{\frac{1}{x}} = e^{-\frac{1}{2}}$

82. $\lim_{x\to \infty} (e^x + x)^{\frac{1}{x}} = e$

83. $\lim_{x\to 0} \dfrac{\sinh^{-1} x}{x} = 1$

**Integrals:** Compute each of the following integrals.

84. $\displaystyle\int (e^x + x)^2 \; dx = \frac{e^{2x}}{2} + 2xe^x - 2e^x + \frac{x^3}{3} + C$

85. $\displaystyle\int \frac{\sec^2(3x)}{\sqrt{1+\tan^2(3x)}} \; dx = \frac{1}{3}\sinh^{-1}(\tan(3x)) + C$

86. $\displaystyle\int (x+7)e^{2x+3} \; dx = \frac{(x+7)e^{2x+3}}{2} - \frac{e^{2x+3}}{4} + C$

87. $\displaystyle\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} x\sec^2 x \; dx = \frac{\pi}{4} + \frac{\ln 2}{2} - \frac{\pi}{6\sqrt{3}} - \frac{\ln 3}{2}$

88. $\displaystyle\int \frac{1+x}{\sqrt{x^2-1}} \; dx = \cosh^{-1} x + \sqrt{x^2-1} + C$

89. $\displaystyle\int x\sin^2 x \; dx = \frac{x^2}{4} - \frac{x\sin(2x)}{4} - \frac{\cos(2x)}{8} + C$

90. $\displaystyle\int \tan^2 x \cos^4 x \; dx = \frac{1}{8}\left(x - \frac{1}{4}\sin(4x)\right) + C$

91. $\displaystyle\int \frac{1}{\sqrt{1-25x^2}} \; dx = \frac{1}{5}\arcsin(5x) + C$

92. $\displaystyle\int \frac{1}{\sqrt{25-x^2}} \; dx = \arcsin\left(\frac{x}{5}\right) + C$

93. $\displaystyle\int \frac{1}{x^2+25} \; dx = \frac{1}{5}\arctan\left(\frac{x}{5}\right) + C$

94. $\displaystyle\int \frac{1}{25x^2+1} \; dx = \frac{1}{5}\arctan(5x) + C$

95. $\displaystyle\int_0^{\ln 4} x^2\cosh x \; dx = \frac{15(\ln 4)^2 - 34\ln 4 + 30}{8}$

96. $\displaystyle\int \frac{1}{x\sqrt{9-\ln^2 x}} \; dx = \arcsin\left(\frac{\ln x}{3}\right) + C$

97. $\displaystyle\int_0^{\frac{\pi}{4}} x\cos x - x\sin x \; dx = \frac{\sqrt{2}\pi}{4} - 1$

98. $\displaystyle\int \frac{e^{3x}}{1+e^{2x}} \; dx = e^x - \arctan e^x + C$

99. $\displaystyle\int x\sin^3 x\cos^2 x \, dx = x\left(-\frac{\cos^3 x}{3} + \frac{\cos^5 x}{5}\right) + \frac{\sin x}{3} - \frac{\sin^3 x}{9} - \frac{\sin x}{5} + \frac{2\sin^3 x}{15} - \frac{\sin^5 x}{25}$ CHALLENGE!

100. $\displaystyle\int \arctan\left(\frac{1}{x}\right) \; dx = x\arctan x + \frac{1}{2}\ln(x^2+1) + C$

101. $\displaystyle\int \frac{1}{(4-x^2)^{\frac{3}{2}}}\ dx = \frac{1}{4}\left(\frac{x}{\sqrt{4-x^2}}\right) + C$

102. $\displaystyle\int x\arctan(3x)\ dx = \frac{x^2}{2}\arctan(3x) - \frac{1}{6}\left(x - \frac{1}{3}\arctan(3x)\right) + C$ CHALLENGE!

103. $\displaystyle\int \arcsin x \frac{\ln(\arcsin x)}{\sqrt{1-x^2}}\ dx = \frac{(\arcsin x)^2\ln(\arcsin x)}{2} - \frac{(\arcsin x)^2}{4} + C$

104. $\displaystyle\int_1^e \ln x\ dx = 1$

105. $\displaystyle\int \frac{\ln(2x^5)}{x^2}\ dx = -\frac{\ln(2x^5)}{x} - \frac{5}{x} + C$

106. $\displaystyle\int \ln^2(x^{20})\ dx = x\ln^2(x^{20}) - 40x\ln(x^{20}) + 800x + C$

107. $\displaystyle\int \tanh(7x)\ dx = \frac{1}{7}\ln|\cosh(7x)| + C$

108. $\displaystyle\int \sqrt{x}\ln(x^3)\ dx = \frac{2}{3}x^{\frac{3}{2}}\ln(x^3) - \frac{4}{3}x^{\frac{3}{2}} + C$

109. $\displaystyle\int \frac{1}{(x^2+4)^{\frac{3}{2}}}\ dx = \frac{x}{4\sqrt{x^2+4}} + C$

110. $\displaystyle\int e^x\sin^2(e^x)\cos^2(e^x)\ dx = \frac{1}{8}\left(e^x - \frac{1}{4}\sin(4e^x)\right) + C$

111. $\displaystyle\int \frac{e^x}{\sqrt{e^{2x}+9}}\ dx = \sinh^{-1}\left(\frac{e^x}{3}\right) + C$

112. $\displaystyle\int \sin^5 x\cos^2 x\ dx = -\frac{\cos^3 x}{3} + \frac{2\cos^5 x}{5} - \frac{\cos^7 x}{7} + C$

113. $\displaystyle\int \sin^2 x\cos^3 x\ dx = \frac{\sin^3 x}{3} - \frac{\sin^5 x}{5} + C$

114. $\displaystyle\int e^x\cosh(2-e^x)\ dx = -\sinh(2-e^x) + C$

115. $\displaystyle\int \sec^6 x\tan^2 x\ dx = \frac{\tan^3 x}{3} + \frac{2\tan^5 x}{5} + \frac{\tan^7 x}{7} + C$

116. $\displaystyle\int \sin^2 x\tan^2 x\ dx = \tan x - \frac{3x}{2} + \frac{\sin(2x)}{4} + C$

117. $\displaystyle\int \frac{\sinh x}{\sqrt{16-\cosh^2 x}}\ dx = \arcsin\left(\frac{\cosh x}{4}\right) + C$

118. $\displaystyle\int_0^1 x\tan^{-1}(x^2)\ dx = \frac{\pi}{8} - \frac{\ln 2}{4}$

119. $\displaystyle\int \tan^5 x \sec^3 x \, dx = \frac{\sec^7 x}{7} - \frac{2\sec^5 x}{5} + \frac{\sec^3 x}{3} + C$

120. $\displaystyle\int \frac{x^2}{x^6+1} \, dx = \frac{1}{3}\arctan(x^3) + C$

121. $\displaystyle\int_1^{e^2} x \ln\sqrt{x} \, dx = \frac{3e^4+1}{8}$

122. $\displaystyle\int \frac{x^2}{(1-x^2)^{\frac{3}{2}}} \, dx = \frac{x}{\sqrt{1-x^2}} - \arcsin x + C$

123. $\displaystyle\int_1^e (\ln x)^2 \, dx = e - 2$

124. $\displaystyle\int_0^{\sqrt{3}} \frac{1}{\sqrt{4-x^2}} + \frac{1}{x^2+9} \, dx = \frac{7\pi}{18}$

125. $\displaystyle\int_{\frac{\pi}{12}}^{\frac{\pi}{6}} x\cos(2x) \, dx = \frac{\sqrt{3}\pi}{24} + \frac{1}{8} - \frac{\pi}{48} - \frac{\sqrt{3}}{8}$

CHANGE THIS INTEGRAND TO $x\cos(2x)$ instead of $x\cos x$.

126. $\displaystyle\int \frac{x^4}{\sqrt{9x^{10}+1}} \, dx = \frac{1}{15}\sinh^{-1}(3x^5) + C$

127. $\displaystyle\int x^{13}\sqrt{x^7+1} \, dx = \frac{2}{35}(x^7+1)^{\frac{5}{2}} - \frac{2}{21}(x^7+1)^{\frac{3}{2}} + C$

128. $\displaystyle\int x^5 e^{x^2} \, dx = \frac{x^4 e^{x^2}}{2} - x^2 e^{x^2} + e^{x^2} + C$

129. $\displaystyle\int \frac{x^2}{\sqrt{16-x^2}} \, dx = 8\arcsin\left(\frac{x}{4}\right) - \frac{x\sqrt{16-x^2}}{2} + C$

130. $\displaystyle\int x\sqrt{x+1} \, dx = \frac{2}{5}(x+1)^{\frac{5}{2}} - \frac{2}{3}(x+1)^{\frac{3}{2}} + C$

131. $\displaystyle\int \frac{x^7}{(7-x^4)^{\frac{3}{2}}} \, dx = \frac{7}{2\sqrt{7-x^4}} + \frac{\sqrt{7-x^4}}{2} + C$

132. $\displaystyle\int x^3\sqrt{9-x^2} \, dx = -3(9-x^2)^{\frac{3}{2}} + \frac{(9-x^2)^{\frac{5}{2}}}{5} + C$

133. $\displaystyle\int \frac{\sqrt{x^2-4}}{x} \, dx = \sqrt{x^2-4} - 2\text{arcsec}\left(\frac{x}{2}\right) + C$

134. $\displaystyle\int \frac{x^2}{x^2+3} \, dx = x - \sqrt{3}\arctan\left(\frac{x}{\sqrt{3}}\right) + C$

135. $\displaystyle\int_{-3}^{3} \sqrt{9-x^2} \, dx = \frac{9\pi}{2}$ What does this integral represent?

136. $\displaystyle\int \sqrt{1-4x^2}\ dx = \frac{\arcsin(2x)}{4} + \frac{x\sqrt{1-4x^2}}{2} + C$

137. $\displaystyle\int \frac{1}{x^2\sqrt{x^2+4}}\ dx = -\frac{\sqrt{x^2+4}}{4x} + C$

138. $\displaystyle\int \sinh^{-1} x\ dx = x\sinh^{-1} x - \sqrt{x^2-1} + C$

139. $\displaystyle\int_0^{\frac{\ln 7}{2}} \sinh(2x)\ dx = \frac{9}{7}$

140. $\displaystyle\int (e^x + \cos x)^2\ dx = \frac{1}{2}e^{2x} + e^x \sin x + e^x \cos x + \frac{1}{2}\left(x + \frac{1}{2}\sin(2x)\right) + C$

141. $\displaystyle\int_1^e \sqrt{x}\ln x\ dx = \frac{2e^{\frac{3}{2}}+4}{9} + C$

142. $\displaystyle\int \frac{(e^x-1)e^x}{e^{2x}+1}\ dx = \frac{\ln(e^{2x}+1)}{2} - \arctan e^x + C$

143. $\displaystyle\int \frac{\sin^3 x}{\sqrt{\cos x}}\ dx = -2\sqrt{\cos x} + \frac{2}{5}(\cos x)^{\frac{5}{2}} + C$

144. $\displaystyle\int \frac{x+3}{\sqrt{4-x^2}}\ dx = -\sqrt{4-x^2} + 3\arcsin\left(\frac{x}{2}\right) + C$

145. $\displaystyle\int \sin(\ln x))\ dx = \frac{1}{2}\left(-x\cos(\ln x) + x\sin(\ln x)\right) + C$ CHALLENGE!

146. $\displaystyle\int x\arcsin x\ dx = \frac{x^2}{2}\arcsin x - \frac{\arcsin x}{4} + \frac{x\sqrt{1-x^2}}{4} + C$

147. $\displaystyle\int (\arcsin x)^2\ dx = x(\arcsin x)^2 + 2\arcsin x \cdot \sqrt{1-x^2} - 2x + C$ CHALLENGE!