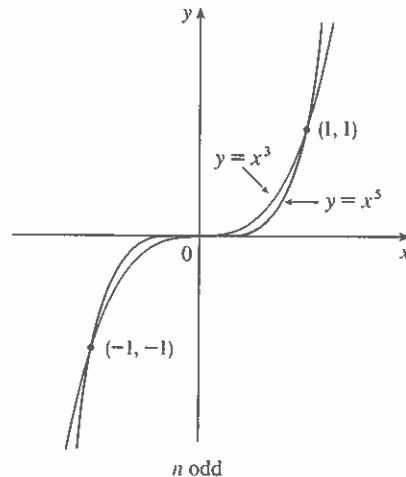
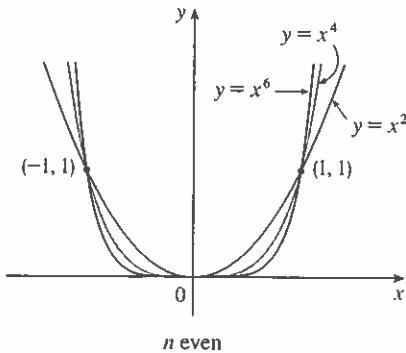


## REFERENCE PAGES

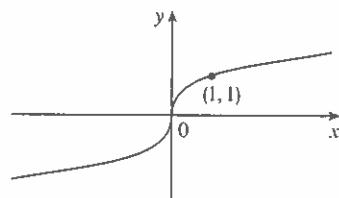
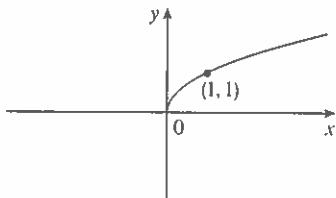
### SPECIAL FUNCTIONS

**Power Functions**  $f(x) = x^a$

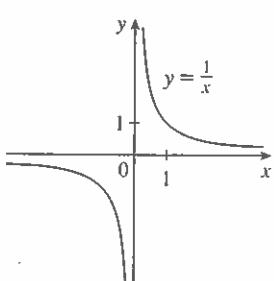
(i)  $f(x) = x^n$ ,  $n$  a positive integer



(ii)  $f(x) = x^{1/n} = \sqrt[n]{x}$ ,  $n$  a positive integer



(iii)  $f(x) = x^{-1} = \frac{1}{x}$

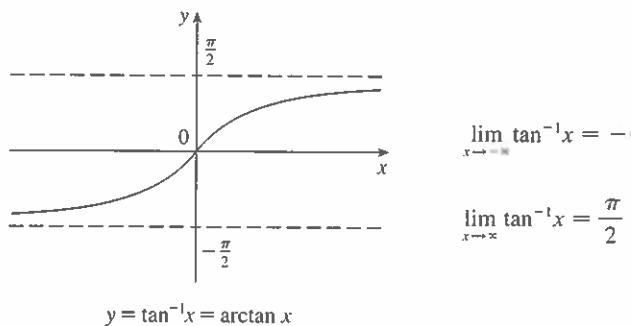


### Inverse Trigonometric Functions

$$\arcsin x = \sin^{-1} x = y \iff \sin y = x \text{ and } -\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$$

$$\arccos x = \cos^{-1} x = y \iff \cos y = x \text{ and } 0 \leq y \leq \pi$$

$$\arctan x = \tan^{-1} x = y \iff \tan y = x \text{ and } -\frac{\pi}{2} < y < \frac{\pi}{2}$$



**AL FUNCTIONS****Exponential and Logarithmic Functions**

$$y \iff a^y = x$$

$\ln e = 1$

$$\iff e^y = x$$

**Inversion Equations**

$$a(a^x) = x \quad a^{\log_a x} = x$$

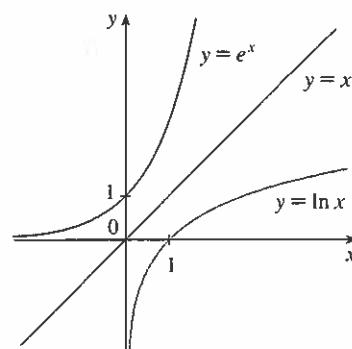
$$e^x = x \quad e^{\ln x} = x$$

**Laws of Logarithms**

$$1. \log_a(xy) = \log_a x + \log_a y$$

$$2. \log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$3. \log_a(x^r) = r \log_a x$$

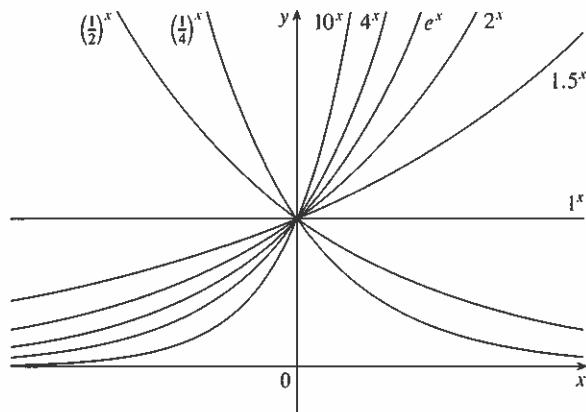


$$\lim_{x \rightarrow -\infty} e^x = 0$$

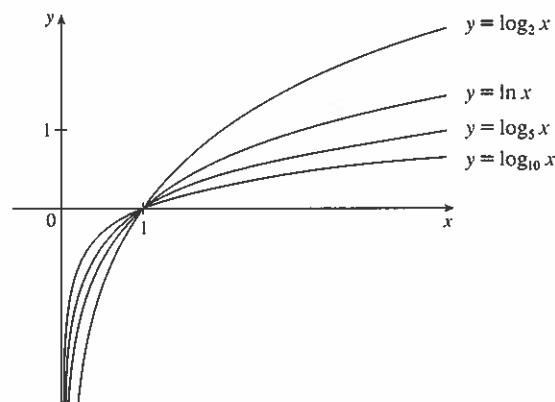
$$\lim_{x \rightarrow \infty} e^x = \infty$$

$$\lim_{x \rightarrow 0^+} \ln x = -\infty$$

$$\lim_{x \rightarrow \infty} \ln x = \infty$$



Exponential functions



Logarithmic functions

**Hypberbolic Functions**

$$\frac{e^x - e^{-x}}{2}$$

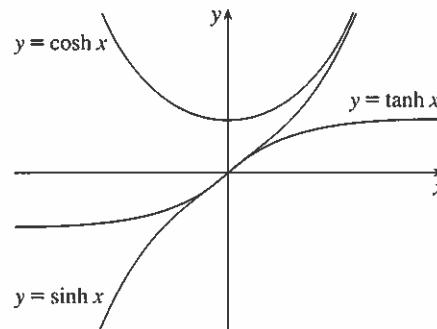
$$\csc x = \frac{1}{\sinh x}$$

$$\frac{e^x + e^{-x}}{2}$$

$$\operatorname{sech} x = \frac{1}{\cosh x}$$

$$\frac{\sinh x}{\cosh x}$$

$$\coth x = \frac{\cosh x}{\sinh x}$$

**Inverse Hyperbolic Functions**

$$\sinh^{-1} x \iff \sinh y = x$$

$$\sinh^{-1} x = \ln(x + \sqrt{x^2 + 1})$$

$$\cosh^{-1} x \iff \cosh y = x \text{ and } y \geq 0$$

$$\cosh^{-1} x = \ln(x + \sqrt{x^2 - 1})$$

$$\tanh^{-1} x \iff \tanh y = x$$

$$\tanh^{-1} x = \frac{1}{2} \ln\left(\frac{1+x}{1-x}\right)$$

## REFERENCE PAGES

### DIFFERENTIATION RULES

#### General Formulas

1.  $\frac{d}{dx}(c) = 0$
2.  $\frac{d}{dx}[cf(x)] = cf'(x)$
3.  $\frac{d}{dx}[f(x) + g(x)] = f'(x) + g'(x)$
4.  $\frac{d}{dx}[f(x) - g(x)] = f'(x) - g'(x)$
5.  $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$  (Product Rule)
6.  $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$  (Quotient Rule)
7.  $\frac{d}{dx}f(g(x)) = f'(g(x))g'(x)$  (Chain Rule)
8.  $\frac{d}{dx}(x^n) = nx^{n-1}$  (Power Rule)

#### Exponential and Logarithmic Functions

9.  $\frac{d}{dx}(e^x) = e^x$
10.  $\frac{d}{dx}(a^x) = a^x \ln a$
11.  $\frac{d}{dx}\ln|x| = \frac{1}{x}$
12.  $\frac{d}{dx}(\log_a x) = \frac{1}{x \ln a}$

#### Trigonometric Functions

13.  $\frac{d}{dx}(\sin x) = \cos x$
14.  $\frac{d}{dx}(\cos x) = -\sin x$
15.  $\frac{d}{dx}(\tan x) = \sec^2 x$
16.  $\frac{d}{dx}(\csc x) = -\csc x \cot x$
17.  $\frac{d}{dx}(\sec x) = \sec x \tan x$
18.  $\frac{d}{dx}(\cot x) = -\csc^2 x$

#### Inverse Trigonometric Functions

19.  $\frac{d}{dx}(\sin^{-1}x) = \frac{1}{\sqrt{1-x^2}}$
20.  $\frac{d}{dx}(\cos^{-1}x) = -\frac{1}{\sqrt{1-x^2}}$
21.  $\frac{d}{dx}(\tan^{-1}x) = \frac{1}{1+x^2}$
22.  $\frac{d}{dx}(\csc^{-1}x) = -\frac{1}{x\sqrt{x^2-1}}$
23.  $\frac{d}{dx}(\sec^{-1}x) = \frac{1}{x\sqrt{x^2-1}}$
24.  $\frac{d}{dx}(\cot^{-1}x) = -\frac{1}{1+x^2}$

#### Hyperbolic Functions

25.  $\frac{d}{dx}(\sinh x) = \cosh x$
26.  $\frac{d}{dx}(\cosh x) = \sinh x$
27.  $\frac{d}{dx}(\tanh x) = \operatorname{sech}^2 x$
28.  $\frac{d}{dx}(\csc x) = -\csc x \coth x$
29.  $\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} x \tanh x$
30.  $\frac{d}{dx}(\coth x) = -\operatorname{csch}^2 x$

#### Inverse Hyperbolic Functions

31.  $\frac{d}{dx}(\sinh^{-1}x) = \frac{1}{\sqrt{1+x^2}}$
32.  $\frac{d}{dx}(\cosh^{-1}x) = \frac{1}{\sqrt{x^2-1}}$
33.  $\frac{d}{dx}(\tanh^{-1}x) = \frac{1}{1-x^2}$
34.  $\frac{d}{dx}(\csc^{-1}x) = -\frac{1}{|x|\sqrt{x^2+1}}$
35.  $\frac{d}{dx}(\operatorname{sech}^{-1}x) = -\frac{1}{x\sqrt{1-x^2}}$
36.  $\frac{d}{dx}(\coth^{-1}x) = \frac{1}{1-x^2}$

## REFERENCE PAGES

### TABLE OF INTEGRALS

#### Basic Forms

1.  $\int u \, dv = uv - \int v \, du$
2.  $\int u^n \, du = \frac{u^{n+1}}{n+1} + C, \quad n \neq -1$
3.  $\int \frac{du}{u} = \ln |u| + C$
4.  $\int e^u \, du = e^u + C$
5.  $\int a^u \, du = \frac{a^u}{\ln a} + C$
6.  $\int \sin u \, du = -\cos u + C$
7.  $\int \cos u \, du = \sin u + C$
8.  $\int \sec^2 u \, du = \tan u + C$
9.  $\int \csc^2 u \, du = -\cot u + C$
10.  $\int \sec u \tan u \, du = \sec u + C$
11.  $\int \csc u \cot u \, du = -\csc u + C$
12.  $\int \tan u \, du = \ln |\sec u| + C$
13.  $\int \cot u \, du = \ln |\sin u| + C$
14.  $\int \sec u \, du = \ln |\sec u + \tan u| + C$
15.  $\int \csc u \, du = \ln |\csc u - \cot u| + C$
16.  $\int \frac{du}{\sqrt{a^2 - u^2}} = \sin^{-1} \frac{u}{a} + C, \quad a > 0$
17.  $\int \frac{du}{a^2 + u^2} = \frac{1}{a} \tan^{-1} \frac{u}{a} + C$
18.  $\int \frac{du}{u \sqrt{u^2 - a^2}} = \frac{1}{a} \sec^{-1} \frac{u}{a} + C$
19.  $\int \frac{du}{a^2 - u^2} = \frac{1}{2a} \ln \left| \frac{u+a}{u-a} \right| + C$
20.  $\int \frac{du}{u^2 - a^2} = \frac{1}{2a} \ln \left| \frac{u-a}{u+a} \right| + C$

#### Forms Involving $\sqrt{a^2 + u^2}$ , $a > 0$

21.  $\int \sqrt{a^2 + u^2} \, du = \frac{u}{2} \sqrt{a^2 + u^2} + \frac{a^2}{2} \ln(u + \sqrt{a^2 + u^2}) + C$
22.  $\int u^2 \sqrt{a^2 + u^2} \, du = \frac{u}{8} (a^2 + 2u^2) \sqrt{a^2 + u^2} - \frac{a^4}{8} \ln(u + \sqrt{a^2 + u^2}) + C$
23.  $\int \frac{\sqrt{a^2 + u^2}}{u} \, du = \sqrt{a^2 + u^2} - a \ln \left| \frac{a + \sqrt{a^2 + u^2}}{u} \right| + C$
24.  $\int \frac{\sqrt{a^2 + u^2}}{u^2} \, du = -\frac{\sqrt{a^2 + u^2}}{u} + \ln(u + \sqrt{a^2 + u^2}) + C$
25.  $\int \frac{du}{\sqrt{a^2 + u^2}} = \ln(u + \sqrt{a^2 + u^2}) + C$
26.  $\int \frac{u^2 \, du}{\sqrt{a^2 + u^2}} = \frac{u}{2} \sqrt{a^2 + u^2} - \frac{a^2}{2} \ln(u + \sqrt{a^2 + u^2}) + C$
27.  $\int \frac{du}{u \sqrt{a^2 + u^2}} = -\frac{1}{a} \ln \left| \frac{\sqrt{a^2 + u^2} + a}{u} \right| + C$
28.  $\int \frac{du}{u^2 \sqrt{a^2 + u^2}} = -\frac{\sqrt{a^2 + u^2}}{a^2 u} + C$
29.  $\int \frac{du}{(a^2 + u^2)^{3/2}} = \frac{u}{a^2 \sqrt{a^2 + u^2}} + C$

## REFERENCE PAGES

### TABLE OF INTEGRALS

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**Forms Involving  $\sqrt{a^2 - u^2}$ ,  $a > 0$**

$$30. \int \sqrt{a^2 - u^2} du = \frac{u}{2} \sqrt{a^2 - u^2} + \frac{a^2}{2} \sin^{-1} \frac{u}{a} + C$$

$$31. \int u^2 \sqrt{a^2 - u^2} du = \frac{u}{8} (2u^2 - a^2) \sqrt{a^2 - u^2} + \frac{a^4}{8} \sin^{-1} \frac{u}{a} + C$$

$$32. \int \frac{\sqrt{a^2 - u^2}}{u} du = \sqrt{a^2 - u^2} - a \ln \left| \frac{a + \sqrt{a^2 - u^2}}{u} \right| + C$$

$$33. \int \frac{\sqrt{a^2 - u^2}}{u^2} du = -\frac{1}{u} \sqrt{a^2 - u^2} - \sin^{-1} \frac{u}{a} + C$$

$$34. \int \frac{u^2 du}{\sqrt{a^2 - u^2}} = -\frac{u}{2} \sqrt{a^2 - u^2} + \frac{a^2}{2} \sin^{-1} \frac{u}{a} + C$$

$$35. \int \frac{du}{u \sqrt{a^2 - u^2}} = -\frac{1}{a} \ln \left| \frac{a + \sqrt{a^2 - u^2}}{u} \right| + C$$

$$36. \int \frac{du}{u^2 \sqrt{a^2 - u^2}} = -\frac{1}{a^2 u} \sqrt{a^2 - u^2} + C$$

$$37. \int (a^2 - u^2)^{3/2} du = -\frac{u}{8} (2u^2 - 5a^2) \sqrt{a^2 - u^2} + \frac{3a^4}{8} \sin^{-1} \frac{u}{a} + C$$

$$38. \int \frac{du}{(a^2 - u^2)^{3/2}} = \frac{u}{a^2 \sqrt{a^2 - u^2}} + C$$

**Forms Involving  $\sqrt{u^2 - a^2}$ ,  $a > 0$**

$$39. \int \sqrt{u^2 - a^2} du = \frac{u}{2} \sqrt{u^2 - a^2} - \frac{a^2}{2} \ln |u + \sqrt{u^2 - a^2}| + C$$

$$40. \int u^2 \sqrt{u^2 - a^2} du = \frac{u}{8} (2u^2 - a^2) \sqrt{u^2 - a^2} - \frac{a^4}{8} \ln |u + \sqrt{u^2 - a^2}| + C$$

$$41. \int \frac{\sqrt{u^2 - a^2}}{u} du = \sqrt{u^2 - a^2} - a \cos^{-1} \frac{a}{|u|} + C$$

$$42. \int \frac{\sqrt{u^2 - a^2}}{u^2} du = -\frac{\sqrt{u^2 - a^2}}{u} + \ln |u + \sqrt{u^2 - a^2}| + C$$

$$43. \int \frac{du}{\sqrt{u^2 - a^2}} = \ln |u + \sqrt{u^2 - a^2}| + C$$

$$44. \int \frac{u^2 du}{\sqrt{u^2 - a^2}} = \frac{u}{2} \sqrt{u^2 - a^2} + \frac{a^2}{2} \ln |u + \sqrt{u^2 - a^2}| + C$$

$$45. \int \frac{du}{u^2 \sqrt{u^2 - a^2}} = \frac{\sqrt{u^2 - a^2}}{a^2 u} + C$$

$$46. \int \frac{du}{(u^2 - a^2)^{3/2}} = -\frac{u}{a^2 \sqrt{u^2 - a^2}} + C$$

## REFERENCE PAGES

### TABLE OF INTEGRALS

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#### Forms Involving $a + bu$

47.  $\int \frac{u \, du}{a + bu} = \frac{1}{b^2} (a + bu - a \ln |a + bu|) + C$

48.  $\int \frac{u^2 \, du}{a + bu} = \frac{1}{2b^3} [(a + bu)^2 - 4a(a + bu) + 2a^2 \ln |a + bu|] + C$

49.  $\int \frac{du}{u(a + bu)} = \frac{1}{a} \ln \left| \frac{u}{a + bu} \right| + C$

50.  $\int \frac{du}{u^2(a + bu)} = -\frac{1}{au} + \frac{b}{a^2} \ln \left| \frac{a + bu}{u} \right| + C$

51.  $\int \frac{u \, du}{(a + bu)^2} = \frac{a}{b^2(a + bu)} + \frac{1}{b^2} \ln |a + bu| + C$

52.  $\int \frac{du}{u(a + bu)^2} = \frac{1}{a(a + bu)} - \frac{1}{a^2} \ln \left| \frac{a + bu}{u} \right| + C$

53.  $\int \frac{u^2 \, du}{(a + bu)^2} = \frac{1}{b^3} \left( a + bu - \frac{a^2}{a + bu} - 2a \ln |a + bu| \right) + C$

54.  $\int u \sqrt{a + bu} \, du = \frac{2}{15b^2} (3bu - 2a)(a + bu)^{3/2} + C$

55.  $\int \frac{u \, du}{\sqrt{a + bu}} = \frac{2}{3b^2} (bu - 2a) \sqrt{a + bu} + C$

56.  $\int \frac{u^2 \, du}{\sqrt{a + bu}} = \frac{2}{15b^3} (8a^2 + 3b^2u^2 - 4abu) \sqrt{a + bu} + C$

57. 
$$\begin{aligned} \int \frac{du}{u \sqrt{a + bu}} &= \frac{1}{\sqrt{a}} \ln \left| \frac{\sqrt{a + bu} - \sqrt{a}}{\sqrt{a + bu} + \sqrt{a}} \right| + C, \quad \text{if } a > 0 \\ &= \frac{2}{\sqrt{-a}} \tan^{-1} \sqrt{\frac{a + bu}{-a}} + C, \quad \text{if } a < 0 \end{aligned}$$

58.  $\int \frac{\sqrt{a + bu}}{u} \, du = 2\sqrt{a + bu} + a \int \frac{du}{u \sqrt{a + bu}}$

59.  $\int \frac{\sqrt{a + bu}}{u^2} \, du = -\frac{\sqrt{a + bu}}{u} + \frac{b}{2} \int \frac{du}{u \sqrt{a + bu}}$

60.  $\int u^n \sqrt{a + bu} \, du = \frac{2}{b(2n + 3)} \left[ u^n (a + bu)^{3/2} - na \int u^{n-1} \sqrt{a + bu} \, du \right]$

61.  $\int \frac{u^n \, du}{\sqrt{a + bu}} = \frac{2u^n \sqrt{a + bu}}{b(2n + 1)} - \frac{2na}{b(2n + 1)} \int \frac{u^{n-1} \, du}{\sqrt{a + bu}}$

62.  $\int \frac{du}{u^n \sqrt{a + bu}} = -\frac{\sqrt{a + bu}}{a(n - 1)u^{n-1}} - \frac{b(2n - 3)}{2a(n - 1)} \int \frac{du}{u^{n-1} \sqrt{a + bu}}$

## REFERENCE PAGES

### TABLE OF INTEGRALS

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#### Trigonometric Forms

63. 
$$\int \sin^2 u \, du = \frac{1}{2}u - \frac{1}{4}\sin 2u + C$$

64. 
$$\int \cos^2 u \, du = \frac{1}{2}u + \frac{1}{4}\sin 2u + C$$

65. 
$$\int \tan^2 u \, du = \tan u - u + C$$

66. 
$$\int \cot^2 u \, du = -\cot u - u + C$$

67. 
$$\int \sin^3 u \, du = -\frac{1}{3}(2 + \sin^2 u) \cos u + C$$

68. 
$$\int \cos^3 u \, du = \frac{1}{3}(2 + \cos^2 u) \sin u + C$$

69. 
$$\int \tan^3 u \, du = \frac{1}{2}\tan^2 u + \ln |\cos u| + C$$

70. 
$$\int \cot^3 u \, du = -\frac{1}{2}\cot^2 u - \ln |\sin u| + C$$

71. 
$$\int \sec^3 u \, du = \frac{1}{2}\sec u \tan u + \frac{1}{2}\ln |\sec u + \tan u| + C$$

72. 
$$\int \csc^3 u \, du = -\frac{1}{2}\csc u \cot u + \frac{1}{2}\ln |\csc u - \cot u| + C$$

73. 
$$\int \sin^n u \, du = -\frac{1}{n}\sin^{n-1} u \cos u + \frac{n-1}{n} \int \sin^{n-2} u \, du$$

74. 
$$\int \cos^n u \, du = \frac{1}{n}\cos^{n-1} u \sin u + \frac{n-1}{n} \int \cos^{n-2} u \, du$$

75. 
$$\int \tan^n u \, du = \frac{1}{n-1}\tan^{n-1} u - \int \tan^{n-2} u \, du$$

#### Inverse Trigonometric Forms

87. 
$$\int \sin^{-1} u \, du = u \sin^{-1} u + \sqrt{1-u^2} + C$$

88. 
$$\int \cos^{-1} u \, du = u \cos^{-1} u - \sqrt{1-u^2} + C$$

89. 
$$\int \tan^{-1} u \, du = u \tan^{-1} u - \frac{1}{2}\ln(1+u^2) + C$$

90. 
$$\int u \sin^{-1} u \, du = \frac{2u^2-1}{4}\sin^{-1} u + \frac{u\sqrt{1-u^2}}{4} + C$$

91. 
$$\int u \cos^{-1} u \, du = \frac{2u^2-1}{4}\cos^{-1} u - \frac{u\sqrt{1-u^2}}{4} + C$$

76. 
$$76. \int \cot^n u \, du = \frac{-1}{n-1} \cot^{n-1} u - \int \cot^{n-2} u \, du$$

77. 
$$77. \int \sec^n u \, du = \frac{1}{n-1} \tan u \sec^{n-2} u + \frac{n-2}{n-1} \int \sec^{n-2} u \, du$$

78. 
$$78. \int \csc^n u \, du = \frac{-1}{n-1} \cot u \csc^{n-2} u + \frac{n-2}{n-1} \int \csc^{n-2} u \, du$$

79. 
$$79. \int \sin au \sin bu \, du = \frac{\sin(a-b)u}{2(a-b)} - \frac{\sin(a+b)u}{2(a+b)} + C$$

80. 
$$80. \int \cos au \cos bu \, du = \frac{\sin(a-b)u}{2(a-b)} + \frac{\sin(a+b)u}{2(a+b)} + C$$

81. 
$$81. \int \sin au \cos bu \, du = -\frac{\cos(a-b)u}{2(a-b)} - \frac{\cos(a+b)u}{2(a+b)} + C$$

82. 
$$82. \int u \sin u \, du = \sin u - u \cos u + C$$

83. 
$$83. \int u \cos u \, du = \cos u + u \sin u + C$$

84. 
$$84. \int u^n \sin u \, du = -u^n \cos u + n \int u^{n-1} \cos u \, du$$

85. 
$$85. \int u^n \cos u \, du = u^n \sin u - n \int u^{n-1} \sin u \, du$$

$$86. \int \sin^n u \cos^m u \, du = -\frac{\sin^{n-1} u \cos^{m+1} u}{n+m} + \frac{n-1}{n+m} \int \sin^{n-2} u \cos^m u \\ = \frac{\sin^{n+1} u \cos^{m-1} u}{n+m} + \frac{m-1}{n+m} \int \sin^n u \cos^{m-2} u$$

92. 
$$92. \int u \tan^{-1} u \, du = \frac{u^2+1}{2} \tan^{-1} u - \frac{u}{2} + C$$

93. 
$$93. \int u^n \sin^{-1} u \, du = \frac{1}{n+1} \left[ u^{n+1} \sin^{-1} u - \int \frac{u^{n+1} du}{\sqrt{1-u^2}} \right], \quad n \neq -1$$

94. 
$$94. \int u^n \cos^{-1} u \, du = \frac{1}{n+1} \left[ u^{n+1} \cos^{-1} u + \int \frac{u^{n+1} du}{\sqrt{1-u^2}} \right], \quad n \neq -1$$

95. 
$$95. \int u^n \tan^{-1} u \, du = \frac{1}{n+1} \left[ u^{n+1} \tan^{-1} u - \int \frac{u^{n+1} du}{1+u^2} \right], \quad n \neq -1$$

**TABLE OF INTEGRALS****Exponential and Logarithmic Forms**

96.  $\int ue^{au} du = \frac{1}{a^2} (au - 1)e^{au} + C$

97.  $\int u^n e^{au} du = \frac{1}{a} u^n e^{au} - \frac{n}{a} \int u^{n-1} e^{au} du$

98.  $\int e^{au} \sin bu du = \frac{e^{au}}{a^2 + b^2} (a \sin bu - b \cos bu) + C$

99.  $\int e^{au} \cos bu du = \frac{e^{au}}{a^2 + b^2} (a \cos bu + b \sin bu) + C$

100.  $\int \ln u du = u \ln u - u + C$

101.  $\int u^n \ln u du = \frac{u^{n+1}}{(n+1)^2} [(n+1) \ln u - 1] + C$

102.  $\int \frac{1}{u \ln u} du = \ln |\ln u| + C$

**Hyperbolic Forms**

103.  $\int \sinh u du = \cosh u + C$

104.  $\int \cosh u du = \sinh u + C$

105.  $\int \tanh u du = \ln \cosh u + C$

106.  $\int \coth u du = \ln |\sinh u| + C$

107.  $\int \operatorname{sech} u du = \tan^{-1} |\sinh u| + C$

108.  $\int \operatorname{csch} u du = \ln |\tanh \frac{1}{2}u| + C$

109.  $\int \operatorname{sech}^2 u du = \tanh u + C$

110.  $\int \operatorname{csch}^2 u du = -\coth u + C$

111.  $\int \operatorname{sech} u \tanh u du = -\operatorname{sech} u + C$

112.  $\int \operatorname{csch} u \coth u du = -\operatorname{csch} u + C$

**Forms Involving  $\sqrt{2au - u^2}$ ,  $a > 0$** 

113.  $\int \sqrt{2au - u^2} du = \frac{u-a}{2} \sqrt{2au - u^2} + \frac{a^2}{2} \cos^{-1}\left(\frac{a-u}{a}\right) + C$

114.  $\int u \sqrt{2au - u^2} du = \frac{2u^2 - au - 3a^2}{6} \sqrt{2au - u^2} + \frac{a^3}{2} \cos^{-1}\left(\frac{a-u}{a}\right) + C$

115.  $\int \frac{\sqrt{2au - u^2}}{u} du = \sqrt{2au - u^2} + a \cos^{-1}\left(\frac{a-u}{a}\right) + C$

116.  $\int \frac{\sqrt{2au - u^2}}{u^2} du = -\frac{2\sqrt{2au - u^2}}{u} - \cos^{-1}\left(\frac{a-u}{a}\right) + C$

117.  $\int \frac{du}{\sqrt{2au - u^2}} = \cos^{-1}\left(\frac{a-u}{a}\right) + C$

118.  $\int \frac{u du}{\sqrt{2au - u^2}} = -\sqrt{2au - u^2} + a \cos^{-1}\left(\frac{a-u}{a}\right) + C$

119.  $\int \frac{u^2 du}{\sqrt{2au - u^2}} = -\frac{(u+3a)}{2} \sqrt{2au - u^2} + \frac{3a^2}{2} \cos^{-1}\left(\frac{a-u}{a}\right) + C$

120.  $\int \frac{du}{u \sqrt{2au - u^2}} = -\frac{\sqrt{2au - u^2}}{au} + C$