Domain/Range

Function	Domain	Range
$\sin^{-1}x$	$[-1, 1]$	$[-\pi/2, \pi/2]$
$\cos^{-1}x$	$[-1, 1]$	$[0, \pi]$
$\tan^{-1}x$	$(-\infty, \infty)$	$(-\pi/2, \pi/2)$
$\cot^{-1}x$	$(-\infty, \infty)$	$(0, \pi)$
$\sec^{-1}x$	$R - (-1,1)$	$[0, \pi] - \{\pi/2\}$
$\csc^{-1}x$	$R - (-1,1)$	$[-\pi/2, \pi/2] - \{0\}$

Identities

1. $\sin(\sin^{-1}x) = x$ — $x \in [-1, 1]$
2. $\cos(\cos^{-1}x) = x$ — $x \in [-1, 1]$
3. $\tan(\tan^{-1}x) = x$ — $x \in R$
4. $\cot(\cot^{-1}x) = x$ — $x \in R$
5. $\sec(\sec^{-1}x) = x$ — $x \in R - (-1, 1)$
6. $\csc(\csc^{-1}x) = x$ — $x \in R - (-1, 1)$

7. $\sin^{-1}(\sin x) = x$ — $x \in [-\pi/2, \pi/2]$
8. $\cos^{-1}(\cos x) = x$ — $x \in [0, \pi]$
9. $\tan^{-1}(\tan x) = x$ — $x \in (-\pi/2, \pi/2)$
10. $\cot^{-1}(\cot x) = x$ — $x \in (0, \pi)$
11. $\sec^{-1}(\sec x) = x$ — $x \in [0, \pi] - \{\pi/2\}$
12. $\csc^{-1}(\csc x) = x$ — $x \in [-\pi/2, \pi/2] - \{0\}$

13. $\sin^{-1}x + \cos^{-1}x = \pi/2$ — $x \in [-1, 1]$
14. $\tan^{-1}x + \cot^{-1}x = \pi/2$ — $x \in R$
15. $\sec^{-1}x + \csc^{-1}x = \pi/2$ — $x \in R - (-1, 1)$

16. $\sin^{-1}(-x) = -\sin^{-1}x$ — $x \in [-1, 1]$
17. $\cos^{-1}(-x) = \pi - \cos^{-1}x$ — $x \in [-1, 1]$
18. $\tan^{-1}(-x) = -\tan^{-1}x$ — $x \in R$
19. $\cot^{-1}(-x) = \pi - \cot^{-1}x$ — $x \in R$
20. $\sec^{-1}(-x) = \pi - \sec^{-1}x$ — $x \in R - (-1, 1)$
21. $\csc^{-1}(-x) = -\csc^{-1}x$ — $x \in R - (-1, 1)$

22. $\sin^{-1}x = \csc^{-1}(1/x)$ — $x \in [-1, 1] - \{0\}$
23. $\csc^{-1}x = \sin^{-1}(1/x)$ — $x \in R - (-1, 1)$
24. $\cos^{-1}x = \sec^{-1}(1/x)$ — $x \in [-1, 1] - \{0\}$
25. $\sec^{-1}x = \cos^{-1}(1/x)$ — $x \in R - (-1, 1)$
26. $\tan^{-1}x = \cot^{-1}(1/x)$ — $x \in (0, \infty)$
    $\tan^{-1}x = \cot^{-1}(1/x) - \pi$ — $x \in (-\infty, 0)$
27. $\cot^{-1}x = \tan^{-1}(1/x)$ — $x \in (0, \infty)$
    $\cot^{-1}x = \tan^{-1}(1/x) + \pi$ — $x \in (-\infty, 0)$

28. $\sin^{-1}x = \cos^{-1}\sqrt{1 - x^2}$ — $x \in [0, 1]$
29. $\sin^{-1}x = -\cos^{-1}\sqrt{1 - x^2}$ — $x \in [-1, 0)$
30. $\cos^{-1}x = \sin^{-1}\sqrt{1 - x^2}$ — $x \in [0, 1]$
31. $\cos^{-1}x = \pi - \sin^{-1}\sqrt{1 - x^2}$ — $x \in [-1, 0)$
32. $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x + y}{1 - xy}\right)$
    $x > 0, y > 0, xy < 1$
33. $\tan^{-1}x + \tan^{-1}y = \pi + \tan^{-1}\left(\frac{x + y}{1 - xy}\right)$
    $x > 0, y > 0, xy > 1$
34. $2\tan^{-1}x = \sin^{-1}\frac{2x}{1+x^2}$ — $x \in [-1, 1]$
35. $2\tan^{-1}x = \pi - \sin^{-1}\frac{2x}{1+x^2}$ — $x \in (1, \infty)$
36. $2\tan^{-1}x = -\pi - \sin^{-1}\frac{2x}{1+x^2}$ — $x \in (-\infty, -1)$
37. $2\tan^{-1}x = \cos^{-1}\frac{1-x^2}{1+x^2}$ — $x \in [0, \infty)$
38. $2\tan^{-1}x = -\cos^{-1}\frac{1-x^2}{1+x^2}$ — $x \in (-\infty, 0)$
39. $2\tan^{-1}x = \tan^{-1}\frac{2x}{1-x^2}$ — $x \in (-1, 1)$
40. $2\tan^{-1}x = \pi + \tan^{-1}\frac{2x}{1-x^2}$ — $x \in (1, \infty)$
41. $2\tan^{-1}x = -\pi + \tan^{-1}\frac{2x}{1-x^2}$ — $x \in (-\infty, -1)$

42. $2\sin^{-1}x = \sin^{-1}(2x\sqrt{1 - x^2})$ — $x \in [-1/\sqrt{2}, 1/\sqrt{2}]$
43. $2\sin^{-1}x = \pi - \sin^{-1}(2x\sqrt{1 - x^2})$ — $x \in (1/\sqrt{2}, 1]$
44. $2\sin^{-1}x = -\pi - \sin^{-1}(2x\sqrt{1 - x^2})$ — $x \in [-1, -1/\sqrt{2})$

45. $2\cos^{-1}x = \cos^{-1}(2x^2 - 1)$ — $x \in [0, 1]$
46. $2\cos^{-1}x = 2\pi - \cos^{-1}(2x^2 - 1)$ — $x \in [-1, 0)$

47. $3\sin^{-1}x = \sin^{-1}(3x - 4x^3)$ — $x \in [-1/2, 1/2]$
48. $3\sin^{-1}x = \pi - \sin^{-1}(3x - 4x^3)$ — $x \in (1/2, 1]$
49. $3\sin^{-1}x = -\pi - \sin^{-1}(3x - 4x^3)$ — $x \in [-1, -1/2)$

50. $3\cos^{-1}x = \cos^{-1}(4x^3 - 3x)$ — $x \in [1/2, 1]$
51. $3\cos^{-1}x = 2\pi - \cos^{-1}(4x^3 - 3x)$ — $x \in [-1/2, 1/2)$
52. $3\cos^{-1}x = 2\pi + \cos^{-1}(4x^3 - 3x)$ — $x \in [-1, -1/2)$
53. $3\tan^{-1}x = \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ — $x \in (-1/\sqrt{3}, 1/\sqrt{3})$
54. $3\tan^{-1}x = \pi + \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ — $x \in (1/\sqrt{3}, \infty)$
55. $3\tan^{-1}x = -\pi + \tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)$ — $x \in (-\infty, -1/\sqrt{3})$

56. $\sin^{-1}x + \sin^{-1}y = \sin^{-1}\left(x\sqrt{1 - y^2} + y\sqrt{1 - x^2}\right)$
    $x^2 + y^2 \le 1$, or $xy \le 0$
57. $\sin^{-1}x + \sin^{-1}y = -\sin^{-1}\left(x\sqrt{1 - y^2} + y\sqrt{1 - x^2}\right) + \pi$
    $x^2 + y^2 > 1, x, y \in (0, 1]$
58. $\sin^{-1}x + \sin^{-1}y = -\sin^{-1}\left(x\sqrt{1 - y^2} + y\sqrt{1 - x^2}\right) - \pi$
    $x^2 + y^2 > 1, x, y \in [-1, 0)$