

Bode Plot (3A)

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The Derivative of the Inverse Tangent Function

$$y = \tan(x) \quad \longleftrightarrow \quad \begin{aligned} x &= \tan(y) & +\frac{\pi}{2} < y < -\frac{\pi}{2} & & -\infty < x < +\infty \\ y &= \tan^{-1}(x) \end{aligned}$$

$$f(x) = \tan(x) \quad \longleftrightarrow \quad g(x) = \tan^{-1}(x)$$

$$f'(x) = \sec^2(x)$$

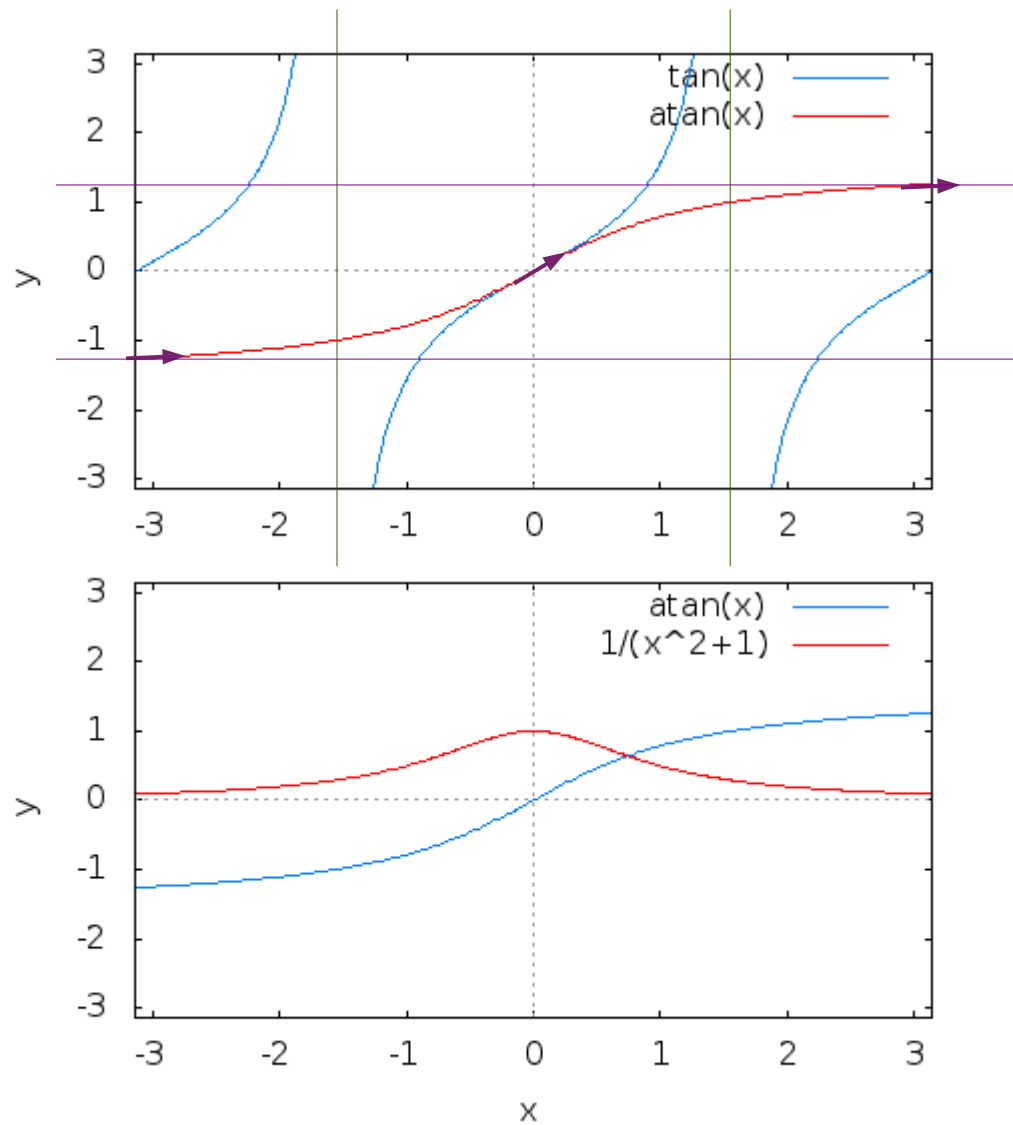
$$g'(x) = \frac{1}{f'(g(x))}$$

$$\begin{aligned} &= \frac{1}{\sec^2(\tan^{-1}(x))} && \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{array} && \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{array} \\ &= \frac{1}{\sec^2(y)} && \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{array} && \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{array} \\ &= \frac{1}{1 + \tan^2(y)} && \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{array} && \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{array} \\ &= \frac{1}{1 + x^2} \end{aligned}$$

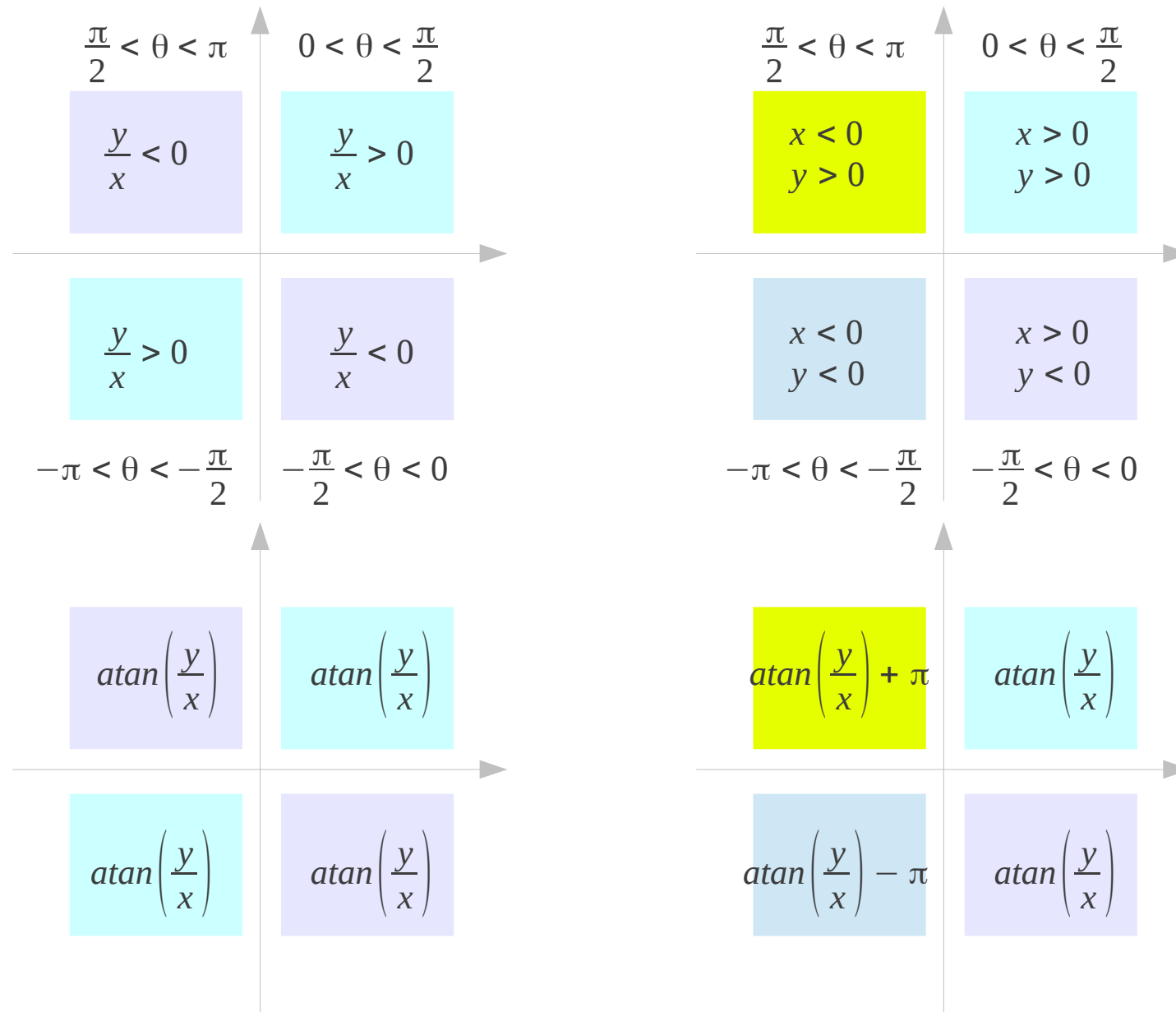
$y = \tan^{-1}(x)$
 $\sec^2(y) = 1 + \tan^2(y)$
 $x = \tan(y)$



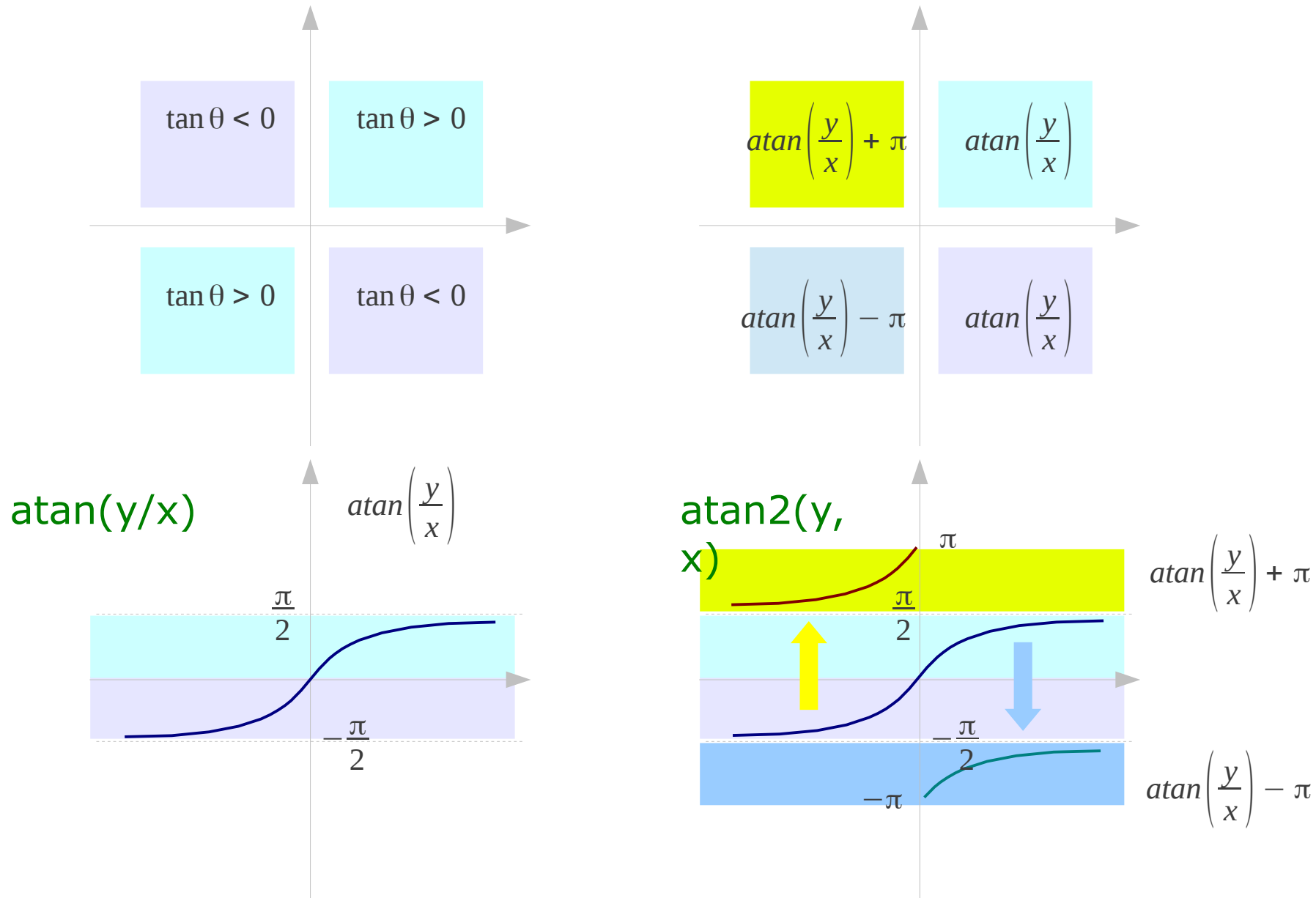
arctan(x)



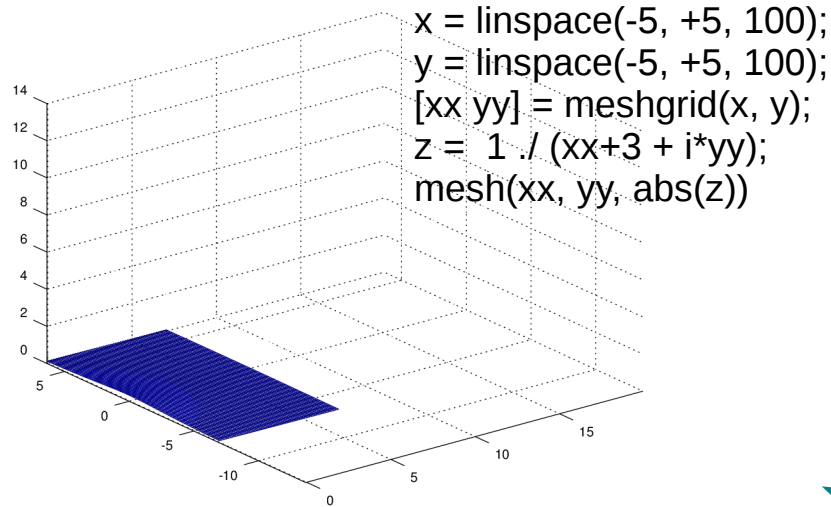
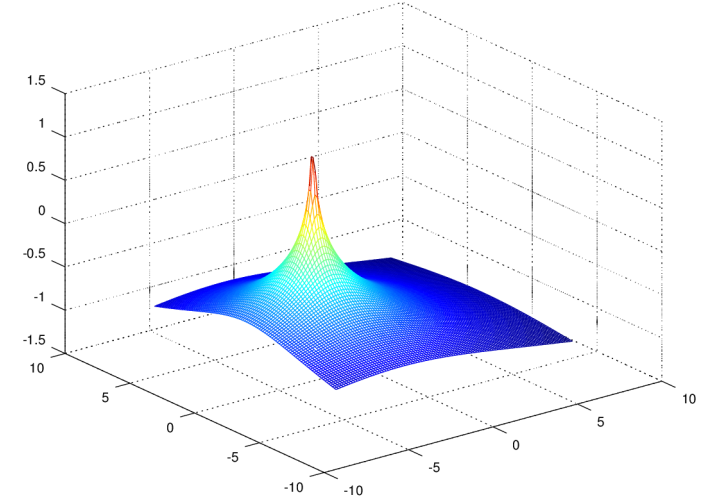
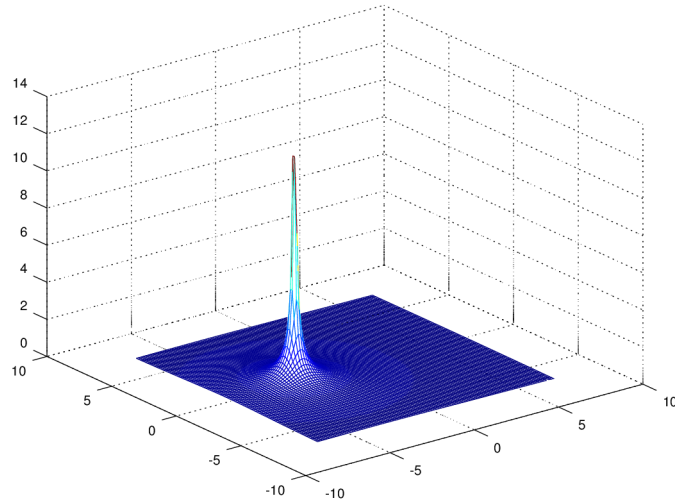
Argument of a Complex Number (1)



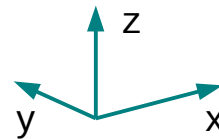
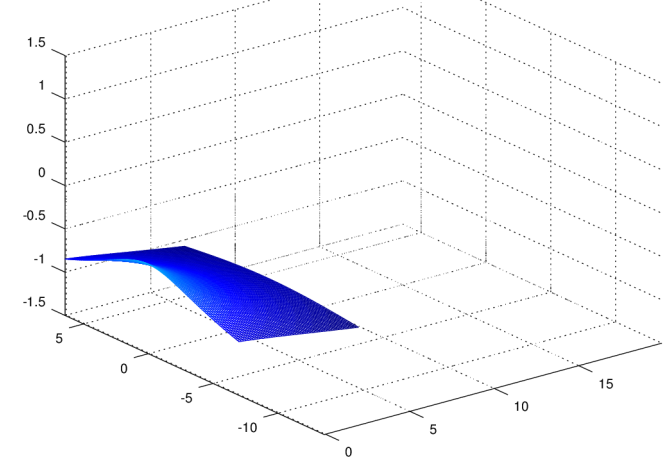
Argument of a Complex Number (2)



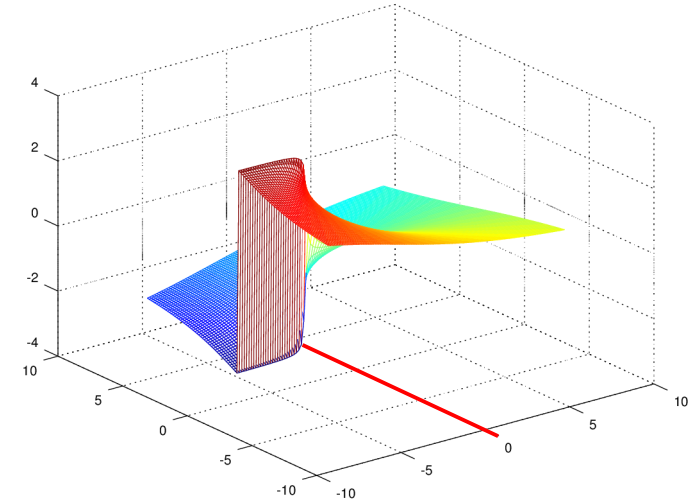
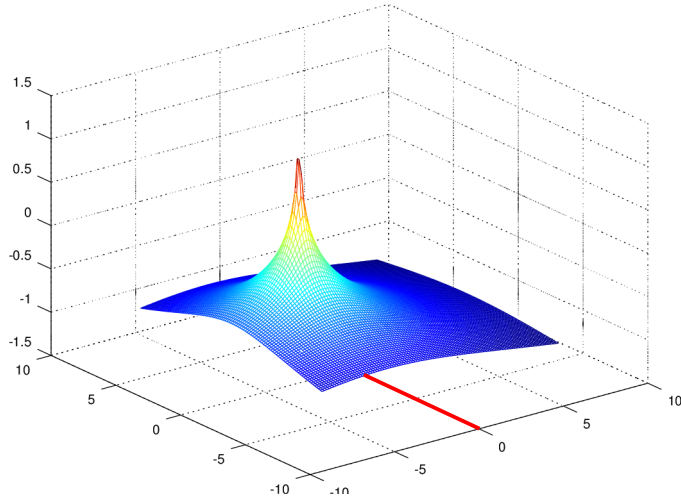
Magnitude Response : $G(s) = 1 / (s + 3)$



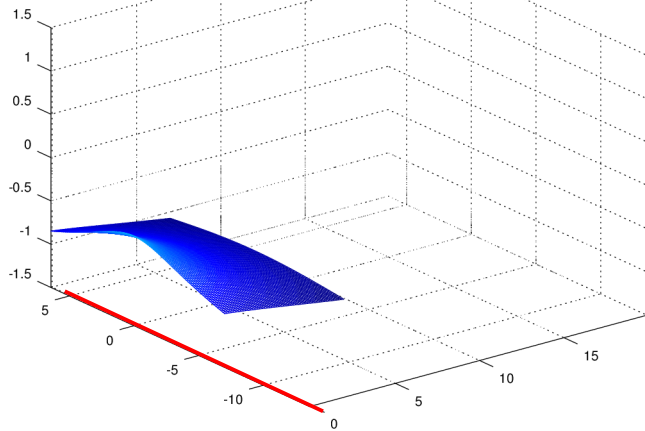
`mesh(xx, yy, log10(abs(z)))`



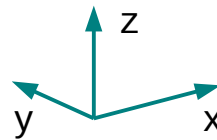
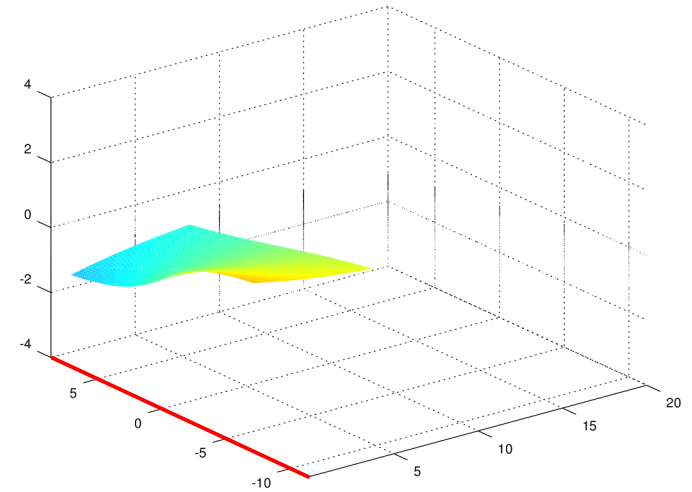
Magnitude & Phase Response : $G(s) = 1 / (s + 3)$



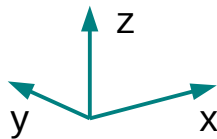
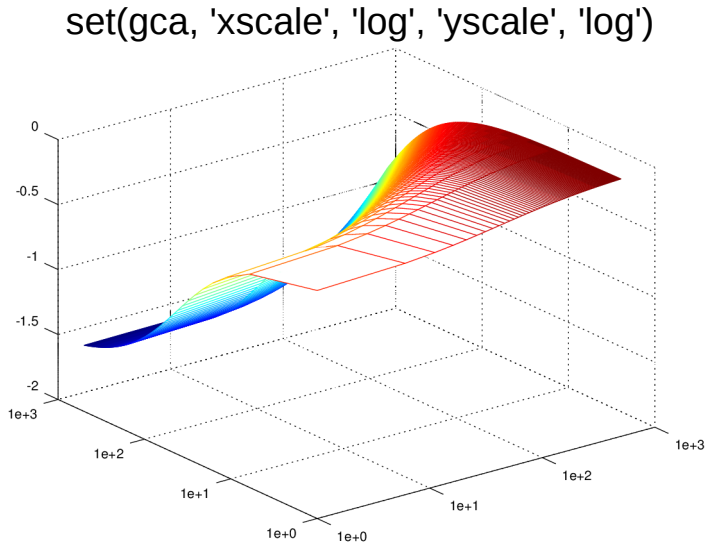
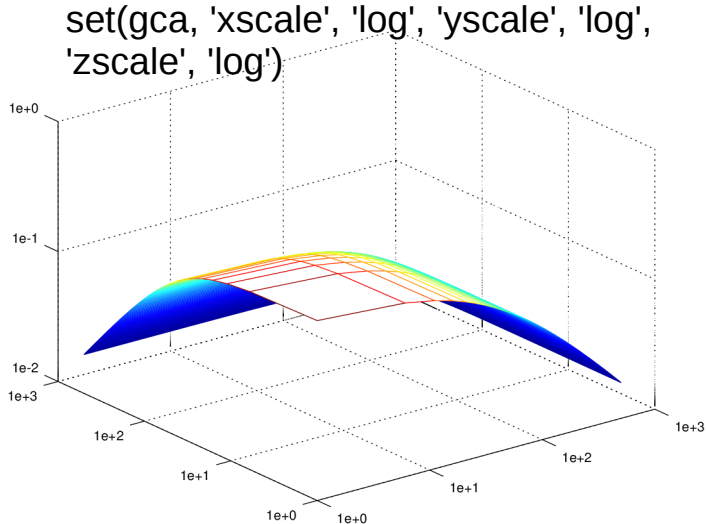
`mesh(xx, yy, log10(abs(z)))`



`mesh(xx, yy, arg(z))`



Log-log Scale Response : $G(s) = 1 / (s + 3)$



References

- [1] <http://en.wikipedia.org/>
- [2] M.L. Boas, "Mathematical Methods in the Physical Sciences"
- [3] E. Kreyszig, "Advanced Engineering Mathematics"
- [4] D. G. Zill, W. S. Wright, "Advanced Engineering Mathematics"