Bode Plot (3A)

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The Derivative of the Inverse Tangent Function

$$y = \tan(x) \iff x = \tan(y) \qquad +\frac{\pi}{2} < y < -\frac{\pi}{2} \qquad -\infty < x < +\infty$$

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

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

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

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

$$= \frac{1}{sec^2(y)}$$

$$= \frac{1}{1+\tan^2(y)}$$

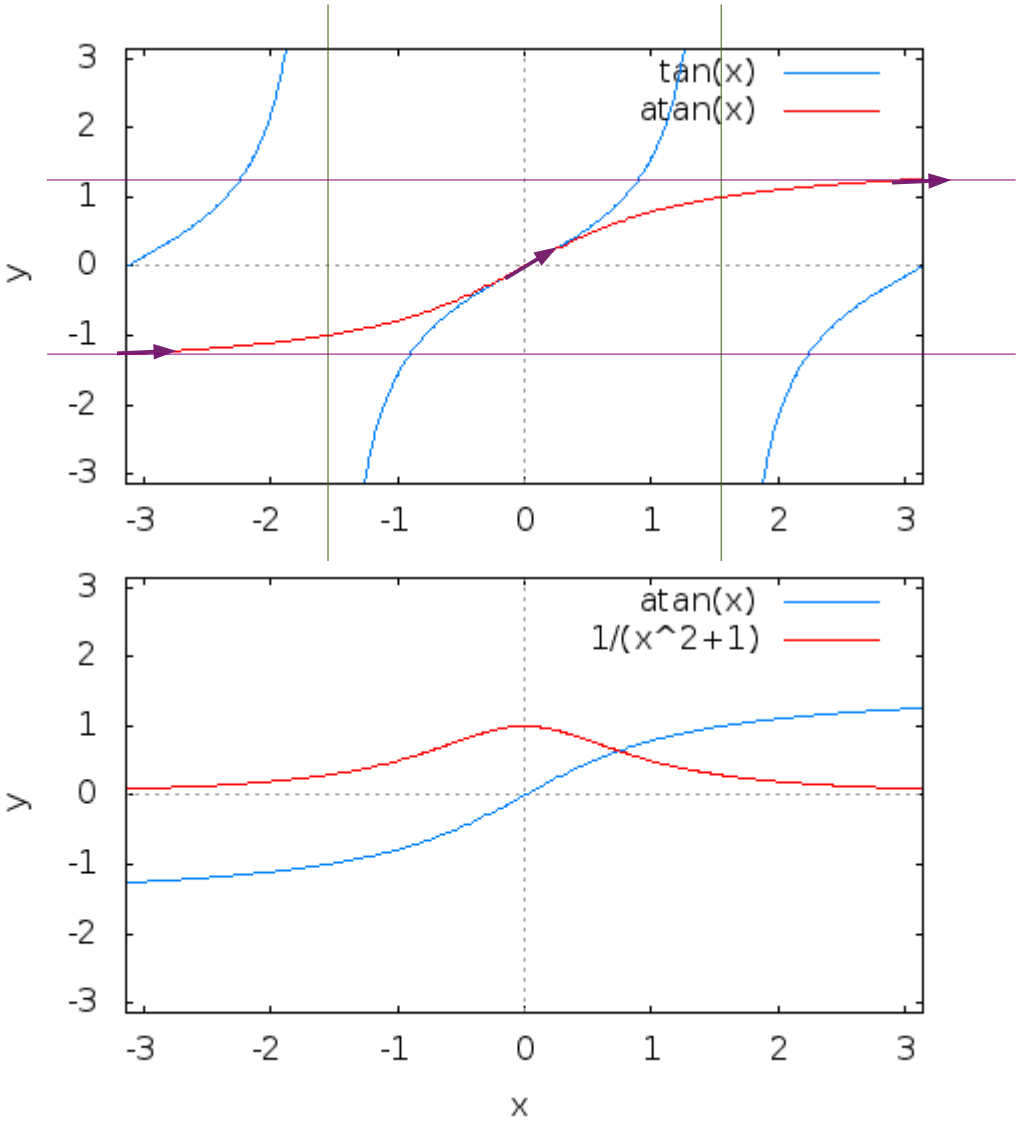
$$\frac{d}{dx}\tan^{-1}(x) = \frac{1}{1+x^2}$$

$y = \tan^{-1}(x)$: x

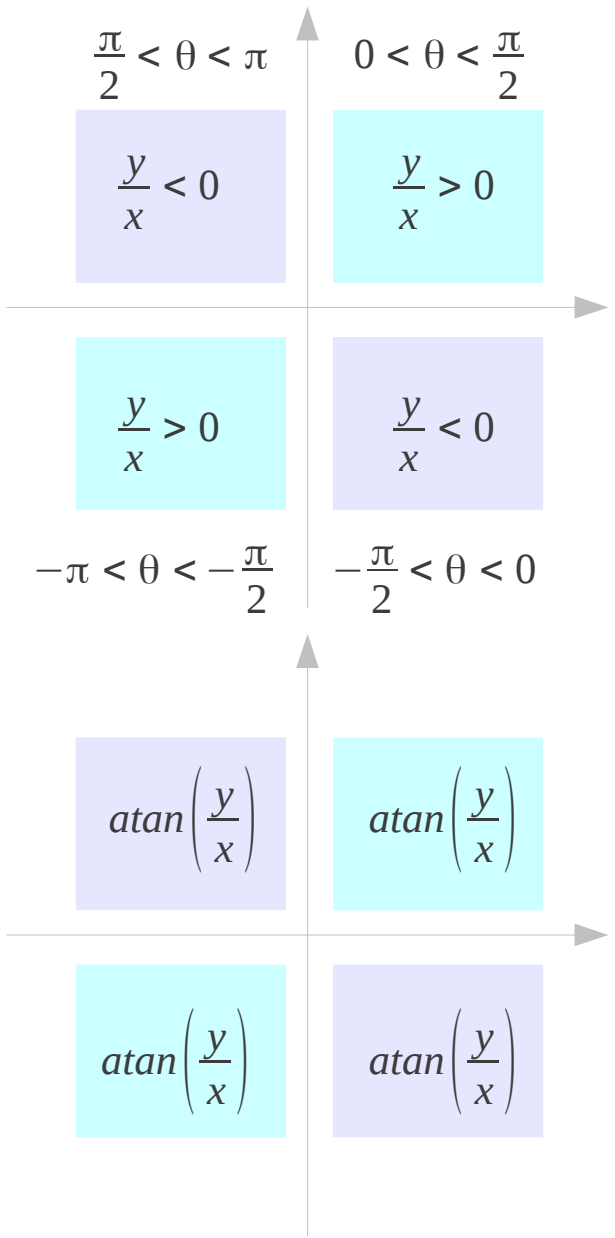
$sec^2(y) = 1+\tan^2(y)$: y

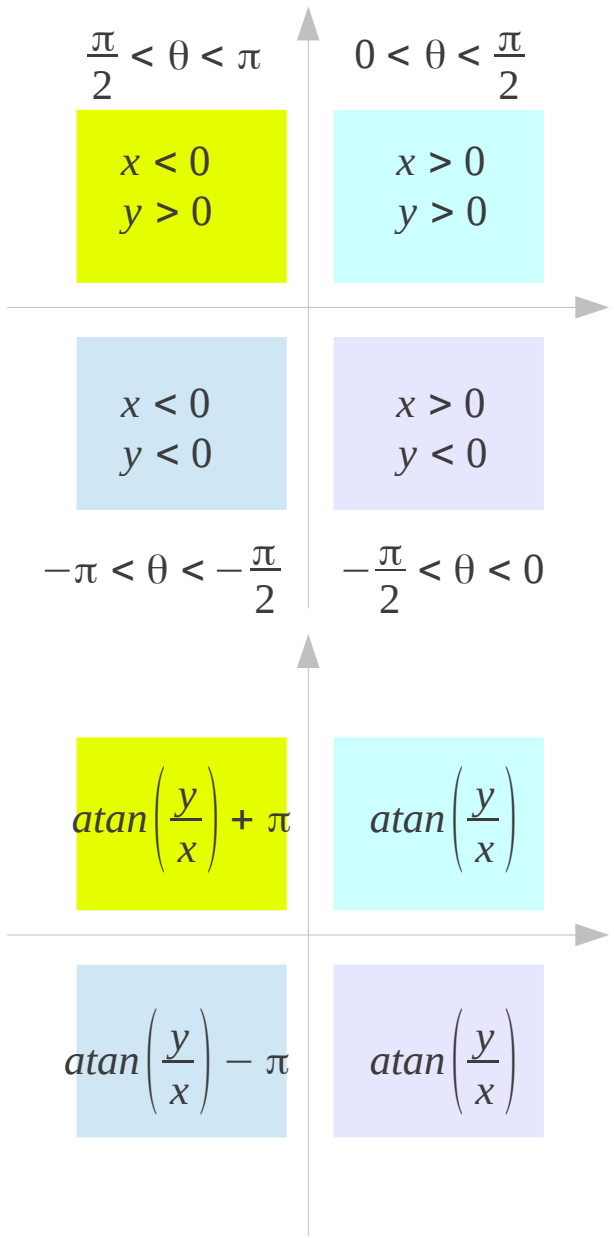
$x = \tan(y)$: x

arctan(x)

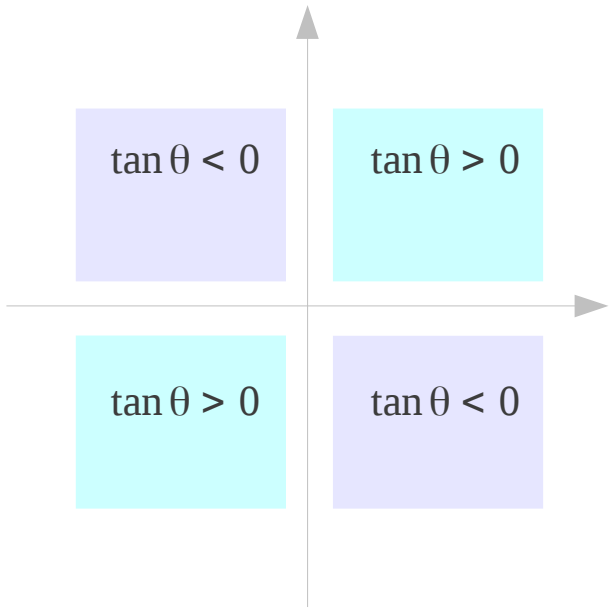


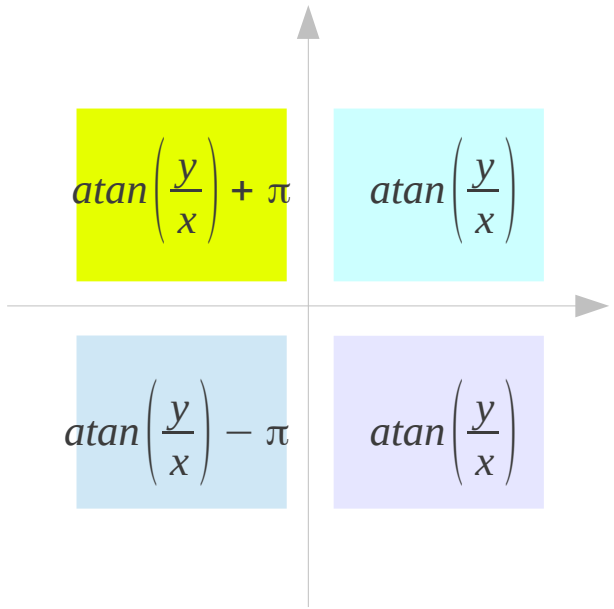
Argument of a Complex Number (1)



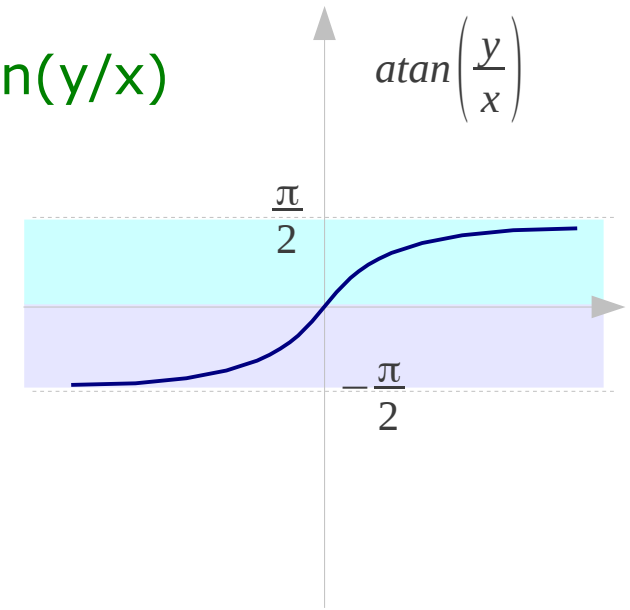


Argument of a Complex Number (2)

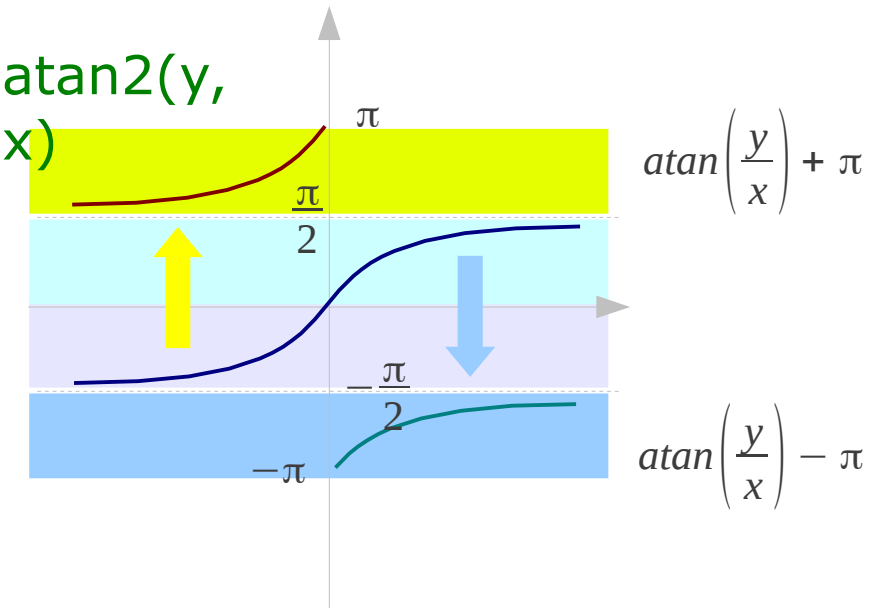




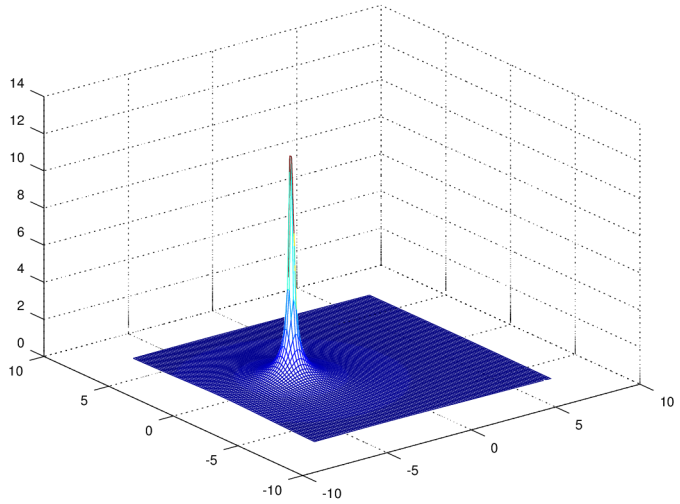
atan(y/x)

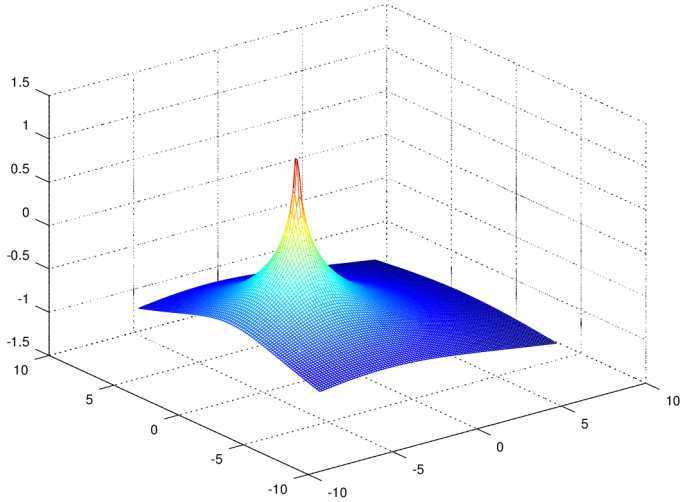


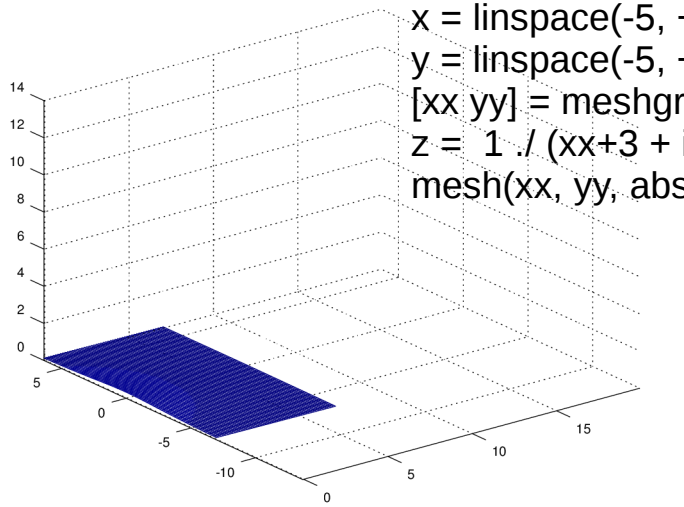
atan2(y, x)



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

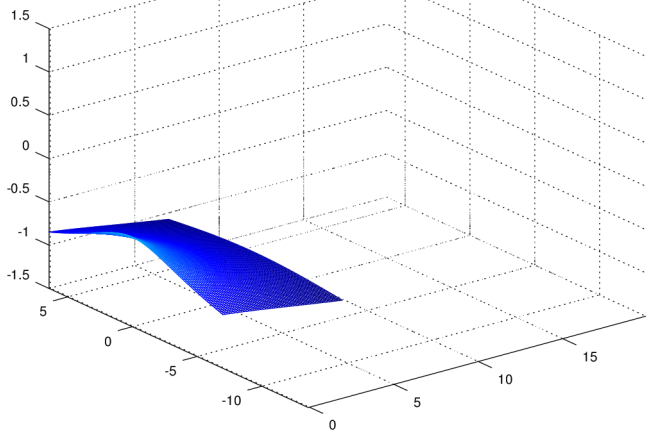


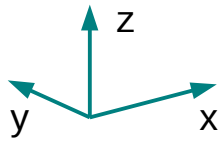




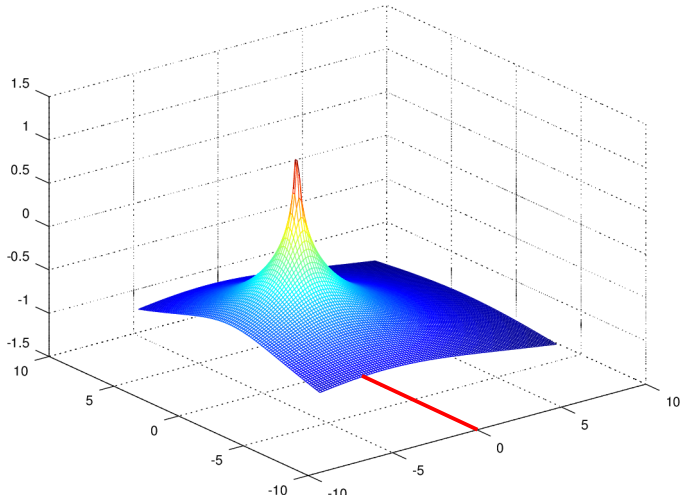

```
x = linspace(-5, +5, 100);
y = linspace(-5, +5, 100);
[xx yy] = meshgrid(x, y);
z =  1 ./ (xx+3 + i*yy);
mesh(xx, yy, abs(z))
```

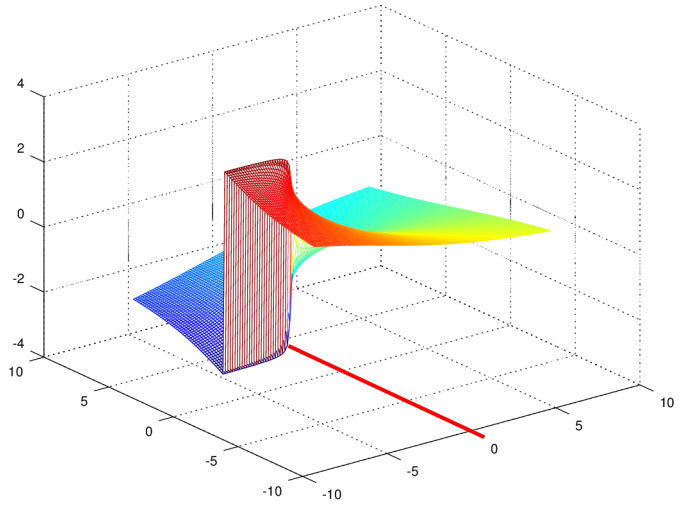
mesh(xx, yy, log10(abs(z)))



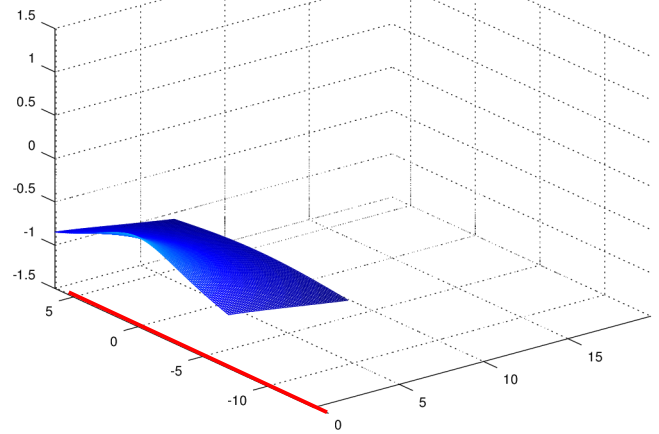


Magnitude & Phase Response : G(s) = 1 / (s + 3)

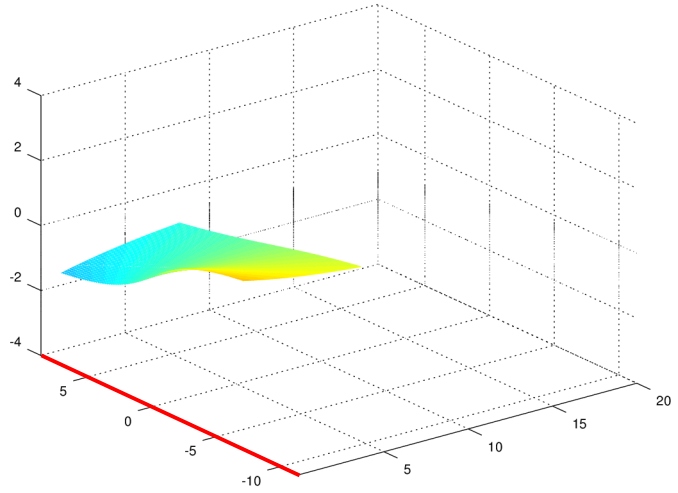


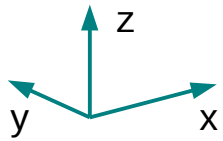


mesh(xx, yy, log10(abs(z)))



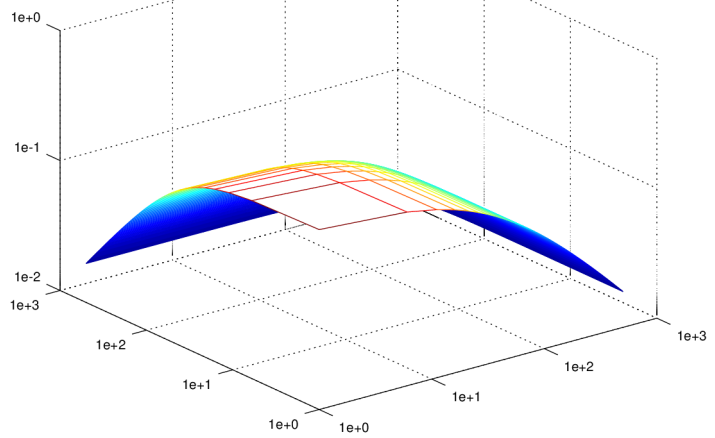
mesh(xx, yy, arg(z))



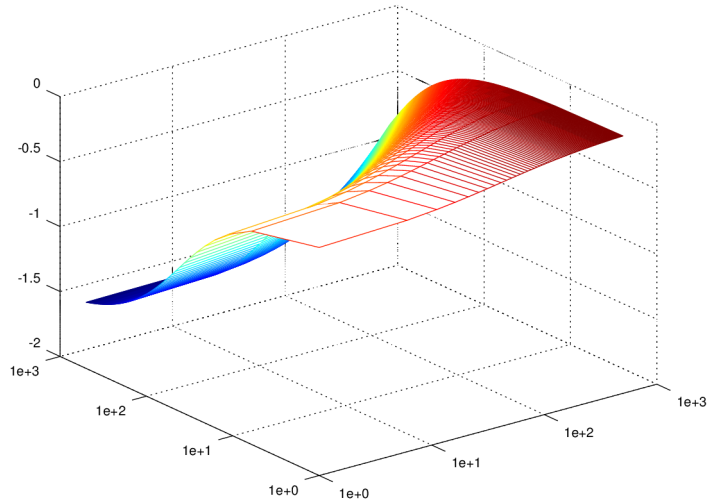


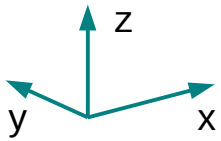
Log-log Scale Response : G(s) = 1 / (s + 3)

set(gca, 'xscale', 'log', 'yscale', 'log', 'zscale', 'log')



set(gca, 'xscale', 'log', 'yscale', 'log')





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”