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## Problem 4.7

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### Problem 4.7

0.0/2.0 points (ungraded)  
Consider the function

$$f(x) = \ln \left[ (1 + x^2)^{1/2} \right],$$

defined for real  $x > 0$  where the branch of the square root is choosen so that  $(1 + x^2)^{1/2} > 0$  for  $x > 0$  and  $\ln$  stays for the principal branch of logarithm. Let  $A$  denote the union of  $\{x : 0 > x > -\infty\}$  and  $\{ix : 1 > x > -1\}$ . Show that there exists a single--valued function  $F(z)$  such that  $f(x) = F(x)$  for real  $x > 0$  and  $F(z)$  is analytic in the complement of  $A$ . Calculate the following limits (use i for complex unity, sqrt(#) for  $\sqrt{\#}$ , e^(#) for the exponential and pi for  $\pi$ ):

$\lim_{\epsilon \rightarrow 0} F(\epsilon) =$

$\lim_{\epsilon \rightarrow 0} F(\epsilon e^{3\pi i/4}) =$

$\lim_{\epsilon \rightarrow 0} F(\epsilon e^{-3\pi i/4}) =$

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