One-Sided Limits

1. Consider the equation of the circle: \( x^2 + y^2 = 16 \).
   (a) Graph the circle on a Cartesian coordinate system.
   (b) Solve the equation for \( y \) and then determine the two functions \( f(x) \) and \( g(x) \) that describe respectively the top half and bottom half of the circle.
   (c) Determine all one sided limits of \( f(x) \) and \( g(x) \) at \( x = -4, -1, 4, 7 \).

2. Repeat exercise 1. using the circle equation \((x - 3)^2 + y^2 = 16\).

3. Consider the piecewise defined function:
   \[
   t(x) = \begin{cases} 
   0 & \text{if } x \leq -\pi \\
   \tan x, & \text{if } -\pi < x < \pi \\
   \frac{2x}{x+6} & \text{if } x \geq \pi 
   \end{cases}
   \]
   (a) Graph the function \( t(x) \).
   (b) Determine all values for \( x \) where the limit fails to exists.
   (c) At each value found in part 3b), determine both one sided limits.
   (d) Determine any horizontal asymptotes of \( t(x) \).