Math 1A **Name (Print):** _____

Chapter 2 Test

Write all responses on separate paper. Show your work in detail for credit. No calculators.

1. Let $P(t)$ be the inches of precipitation at Horse Meadow on day t where $t =$ the number of days since 12/27/2005. The table at right shows the value of this fucntion over a 5 day period.

Date	$P(t)$ (in.)
12/27/2005	0.7
12/28/2005	0.5
12/29/2005	0
12/30/2005	0.9
12/31/2005	1.6

   (a) Use the table to find the average rate of change in precipitation between 12/27/2005 and 12/31/2005. Be sure to specify the units of measure for this rate of change.

   (b) What is your best approximation, based on this table, for rate of change on December 29?

2. Find the limit. Give baby steps and justify each step with a property of limits.

   (a) $\lim_{x\to 2} \dfrac{x^3-8}{x^3-x^2-x-2}$.
   Hint: $x^3-x^2-x-2=(x-2)(x^2+x+1)$

   (b) $\lim_{x\to 2} \dfrac{4-x^2}{|4-x^2|}$

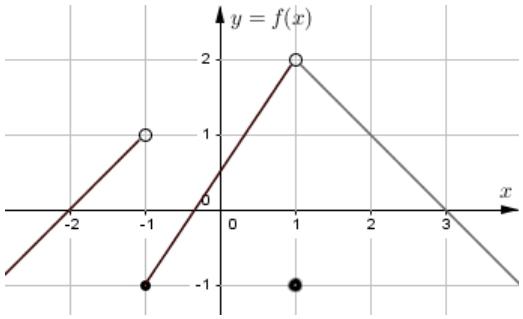
   (c) $\lim_{x\to\infty} \dfrac{\sqrt{x^2-100}}{3x-4}$

   (d) $\lim_{x\to\pi^-} \ln(\tan\left(\frac{x}{2}\right)$

3. Give a formal epsilon-delta definition proof that $\lim_{x\to 3} 2x+1=7$

4. Find the smallest value of N so that if $x > N$ then $\dfrac{\pi}{2} - \arctan(x) < \dfrac{\pi}{4}$

5. Consider the graph of the function $y = f(x)$ shown below:



   (a) Find each limit, or explain why it does not exist. SOLNS:

   i. $\lim_{x\to -1^-} f(x)$ ii. $\lim_{x\to -1^+} f(x)$ iii. $\lim_{x\to 1} f(x)$

   (b) Is f discontinuous where $x=-1$? Justify your answer using the definition of continuity.

   (c) Is f discontinuous where $x=1$? Justify your answer using the definition of continuity.

6. Let

$$f(x) = \begin{cases} \dfrac{x^2-4}{x-2} & : x \leq 2 \\ 1+b & : x = 2 \\ (x-2)^3+4 & : x > 2 \end{cases}$$

Find all values of b so that f is a continuous function.

7. Consider $f(x) = x^2 + x$

(a) Use the **definition** of the derivative to find the derivative function $f'(x)$

(b) Find an equation for the line tangent to the function where $x = 1$

8. Use the intermediate value theorem to show that the equation

$$\sin(\pi\sqrt{x}) = 4x^2 - 4x + 1$$

has a solution for $0 < x < 1$. First state the Intermediate Value Theorem, then show precisely how the premise is satisfied and what conclusion follows.