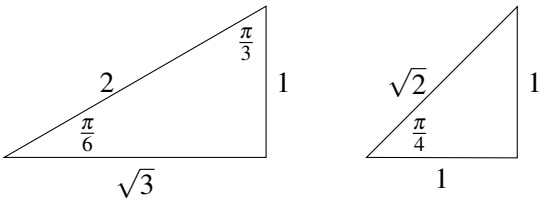
Name:_____

Midterm 1
Math 142, Winter 2017
February 3rd, 2017

- Calculutors are not permitted.
- This exam has 5 questions worth a total of 21 points.
- You have 50 minutes to complete this exam.
- These special triangles might be helpful:



Question	Points	Score
1	5	
2	10	
3	3	
4	3	
5	0	
Total:	21	

1. (5 points) Evaluate $\frac{d}{dx}\ln(\sin x)$.

2. Let $f(x) = x^5 + \ln x$ for $x > 0$.

(a) (5 points) Why does $f(x)$ have an inverse?

(b) (5 points) What is $f^{-1}(1)$?

3. (3 points) Which of these is a U.S. state? (Select the single most correct answer):

   A. Confusion

   B. California

   C. Mexico

   D. Paranoia

4. (3 points) Select all of the true facts about $f(x) = 1/x$.

   ◯ The domain of $f(x)$ is $\mathbb{R}$

   ◯ The derivative of $f(x)$ is $-1/x^2$.

   ◯ The integral of $f(x)$ on $[1,t]$ is $\ln t$.

5. (5 points (bonus)) Let $\pi(x)$ be the number of primes less than or equal to x. Show that

$$\left|\pi(x) - \int_2^x \frac{1}{\ln t}\,dt\right| \leq \frac{\sqrt{x}\ln x}{8\pi}$$

   for $x \geq 3000$.