This sample midterm is not a template for the midterm. It consists of practice problems covering the main ideas of the material. One of the goals for this course is for you to learn how to decide if your own work is correct or not. It is one of the most important skills you will learn at the UW. So we will not give out solutions. There are plenty of other problems in the archives and in the book with complete solutions and there are almost uncountably many with answers. When you think that you understand the material, then do these problems and check your own answers carefully.

The first page is the cover sheet for the midterm. Read it carefully now so that you don't waste time doing so during the exam period. Failure to follow the rules on the cover sheet will result in failure on the exam.

Math 124 **practice Midterm 2** **Autumn 2016**

Your Name (print) _____

Your Signature _____

Student I.D.# | | | | | | | | **Quiz Section** | | |

• Turn in your exam when you are finished. Do not leave the room until the examination is completed. You will lose credit if you leave early.

• Turn off all electronic devices. If your phone rings accidentally, you must ask for permission to turn it off.

• This exam is closed book. You may use one 8.5x11 sheet of handwritten notes (one side), but the notes cannot include completely worked problems.

• The only allowed calculator is TI 30X-IIS.

• In order to receive credit you must show all of your work. Show enough work that the grader can determine what you did to arrive at your answers. Correct answers without justification may not receive much credit.

• If you need more room, use the backs of the pages, but **clearly** indicate you have done so.

Place a box $\boxed{}$ **around your answer whenever that is appropriate.**

Score

1.	
2.	
3.	
4.	
5.	
6.	
Total (100)	

1. Find dy/dx when: $y = (\ln x)^{\ln x}$ where $x > 1$.

2. Find

$$\lim_{x \to \frac{\pi}{2}} \frac{\ln(\sin(x))}{\cos(x)}.$$

Justify your answer.

3. A balloon is released 500 feet away from an observer. If the balloon rises vertically at a rate of 100 feet per minute and at the same time the wind is carrying it horizontally away from the observer at the rate of 75 feet per minute, at what rate is the angle of inclination of the observer's line of sight changing 6 minutes after the balloon has been released? Assume that the balloon is released at the eye-level height of the observer. Hint: one way to get started on this problem is to parametrize the balloon path.

4. (a) Find the linearization of the function $f(x) = x^3$ at $x = 2$.

(b) use your answer to (a) to estimate $10^{1/3}$ (i.e. where $f(x) = 10$).

(c) find the linearization of f at your answer to part (b).

(d) use your answer to (c) to get a better estimate of $10^{1/3}$.

(e) use the second derivative test to decide if your answer is too big or too small. Hint: draw a picture of the tangent line.

5. (a) Find the critical number(s) of $y = x^{\frac{1}{x}}$ for $x > 0$ and give a valid reason whether a local max or local min or neither occurs at the number(s).

(b) Does y have an absolute minimum on $(0, \infty)$? (you must give a valid reason for your answer to receive credit)

(c) Does y have an absolute maximum on $(0, \infty)$? (you must give a valid reason for your answer to receive credit)

(d) Which is bigger $e^{1/e}$ or $\pi^{1/\pi}$?

(e) Which is bigger e^{π} or π^{e}. Do not use a calculator to answer part (d) and part (e).

6. Find dy/dx as a function of t where

$$x = (1 + e^t)^t \qquad \text{and} \qquad \tan y = \sqrt{1 + \ln|t|}$$

Note that the problem asks you to find the derivative with respect to x, but your answer should be a function of t (and only t). Hint: you might want to use the identity $\sec^2(y) = 1 + \tan^2(y)$.