

MATH 226: Calculus I  
**SAMPLE MIDTERM I**

Spring 2010

NAME :

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*NOTE:* There are 5 problems on this midterm (total of 7 pages). Use of calculators will NOT be permitted. In order to receive full credit for any problem, you must show work leading to your answer. You have 50 minutes to complete this test.

Problem	Possible points	Score
1	60	
2	10	
3	10	
4	10	
5	10	
Total	100	

**Problem 1.** (60pts) Differentiate the following functions

(a)  $f(x) = \frac{3}{x^2} + 2\pi^2 x$

(b)  $y = x^2 \sin x$

(c)  $g(t) = \frac{\ln t}{t}$

**Problem 1. (cont'd)**

(d)  $f(x) = e^{\sin(2x)}$

(e)  $y = \frac{1}{\sqrt{x^2 + 1}}$

(f)  $h(s) = \tan^{-1}(s)$

**Problem 2.** (10pts) Find the equation of the tangent line to the following curve at  $(-2, 1)$ .

$$y^2 - 2x - 4y - 1 = 0$$

**Problem 3.** (10pts) The position of a particle is given by  $s = t^3 - 5t^2 + 8t$  meters. (Time  $t$  is measured in seconds.)

- (a) Find the time(s) when the acceleration is zero.
- (b) Find the velocity at the time(s) calculated in part (a). State units in your answer.

**Problem 4.** (10pts) A hot-air balloon rising straight up from a level field is tracked by a range finder 500 ft from the lift off point. At the moment the range finder's elevation angle is  $\frac{\pi}{4}$ , the angle is increasing at a rate of 0.2 rad/min. How fast is the balloon rising at that moment?

**Problem 5.** (10pts) Determine whether  $\lim_{x \rightarrow 1} f(x)$  exists and compute it if it does. Be sure to explain your reasoning.

$$f(x) = \begin{cases} x + 1 & x < 1 \\ 2 & x = 1 \\ 3 - x & x > 1 \end{cases}$$