

MATH 226: Calculus I
MIDTERM I

Spring 2009

NAME :

NOTE: There are 5 problems on this midterm (total of 7 pages). Use of calculators to check your work is permitted; however, 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.

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