S14 MATH 1205 – Test 2 2 April 2014 NAME: _____ CRN:_____

Use only methods from class. You must show work to receive credit.

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1. (32 pts) Find dy/dx for each of the following:

   (a) (7 pts) $y = \ln(x^3 + 4) - \tan^{-1}\left(\frac{x}{2}\right)$

   (b) (7 pts) $y = \log_2(x) \cdot e^{\cot(7x)}$

   (c) (8 pts) $y = \dfrac{\csc(3x)}{\pi^x}$

   (d) (10 pts) $y = \big(\sin(x)\big)^x$

2. (9 pts) Let $f(x) = x^{2013} + e^{2x}$. Find $f^{(2014)}(x)$.

3. (15 pts) For $x > 0$, define $f(x) = x^2 e^x$.

   (a) (2 pts) Evaluate $f(x)$ at $x = 1$.

   (b) (13 pts) Use a theorem from class to find $(f^{-1})'(e)$. Make sure to state and check the conditions that need to hold in order to use the theorem.

4. (22 pts) The position, in miles, of a car traveling along a horizontal axis is represented by the following function of t, given in hours.

$$s(t) = \frac{t^3}{3} - 3t^2 + 5t + 1, \quad 0 \leq t \leq 4.$$

Answer each of the following questions with a complete sentence.

(a) (3 pts) Find the displacement of the car from $t = 0$ to $t = 3$.

(b) (3 pts) Find the average velocity of the car from $t = 0$ to $t = 3$.

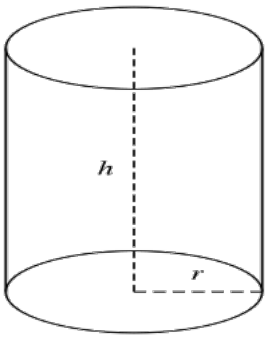
(c) (6 pts) At what times between $t = 0$ and $t = 4$ does the car change direction?

(d) (5 pts) Is the car speeding up or slowing down at time $t = 2$?

(e) (5 pts) Find the total distance traveled by the car from $t = 0$ to $t = 4$.

5. (13 pts) Define a curve by the equation $x^2 + xy + 5y^2 = 35$. Find the equation of the **normal line** to this curve through the point $(5, 1)$.

6. (9 pts) A cylindrical balloon is deflated in such a way that it maintains its shape during deflation. Suppose the radius r is decreasing at a constant rate of 4 cm/s while the height h is decreasing at a constant rate of 2 cm/s. What is the rate of change of the volume when $r = 3$m and $h = 4$m? The volume of a cylinder with radius r and height h is $V = \pi r^2 h$. Answer with a complete sentence.



Honor Pledge: I have neither given nor received aid on this exam. Signature: _____