Math 151
Exam 2
November 20th, 2007

Name: _____

1. Your exam contains 7 questions and 5 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values for problems vary and these are clearly indicated. You have 50 minutes for this exam.
3. Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification.
4. Put a $\boxed{\text{box around your final answer}}$ where applicable.
5. Leave answers in exact form (as simplified as possible).
6. You are allowed one 4" $\times$ 6" notecard (both sides).
7. If you need extra space, use the back of the exam and clearly indicate this.
8. You may use a calculator for this exam, but I will not give credit for work done solely on a calculator (aside from arithmetic).

Problem	Total Points	Score
1	12	
2	15	
3	14	
4	17	
5	14	
6	9	
7	19	
Total	100	

1. (12 pts.) Find an equation of the tangent line of $f(x) = \arctan\left(\frac{1}{x}\right)$ at $x = 1$. (Use exact values.)

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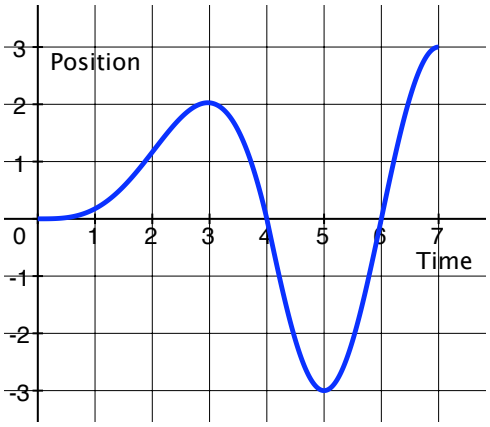
2. (15 pts.) Below is a graph of the **position** of a runaway turkey in feet at t seconds for $0 \leq t \leq 7$.



(a) (3 pts.) Is the turkey's speed greater at 2 seconds or 4 seconds?

(b) (6 pts.) When is the velocity of the turkey positive?

(c) (6 pts.) Find the total distance travelled by the turkey from time 0 to 7 seconds.

3. (14 pts.) Find the linearization at $x = 5$ of $h(x) = \ln(2x - 9) + \dfrac{12}{x-3}$ and use it to approximate $h(4.9)$.

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4. (17 pts.) The **amount of water in** a reservoir in **millions of gallons** is given by
$$w = \sqrt{120t - 3t^2} \quad \text{on a given day } t \text{ with } 0 \leq t \leq 40.$$

   (a) (3 pts.) How much water is in the reservoir on day 30? (Include units.)

   (b) (14 pts.) What is the rate of water flow on day 30? Is the water flowing into or out of the reservoir on that day? (Include units on the rate of water flow.)

5. (14 pts.) Find all x-values for which $f(x) = x^6 e^x + 20$ has a horizontal tangent.

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6. (9 pts.) Find the 43rd derivative of $7\cos(2x)$.

7. (19 pts.) A woman that is 5.5 feet tall is jogging **away** from a 22 foot tall streetlight at a rate of 6 feet per second.

   (a) (16 pts.) At what rate is the **length of her shadow** changing when she is 10 feet away from the light? (Include units.)

   (b) (3 pts.) Is the length of her shadow increasing or decreasing?