Math 117

Midterm Exam

Spring Quarter 2006

Name_____

Rec. Time (TR)_____

Show All Work!! Correct answers with no supporting work may not receive full credit. You are permitted to use an 8.5 inch by 11 inch piece of paper with notes on it (front and back). You are not permitted to use a TI-89. TI-92 (or 92 Plus) or any other calculator with a QWERTY keyboard. **GOOD LUCK!!**

1. (6 points) Find the slope function (i.e., derivative) for $f(x) = -5x^2 + 7x - 473$ by using the "limit" definition.

2. (5 points each) For each of the following, find the derivative of the given function by any means. You need not simplify your answer.

   a. $f(x) = x^4 \ln(x-9)$

   b. $f(x) = \dfrac{e^{7x}}{(\sin x)^5}$

   c. $f(x) = \tan^{-1}(3x-2)$

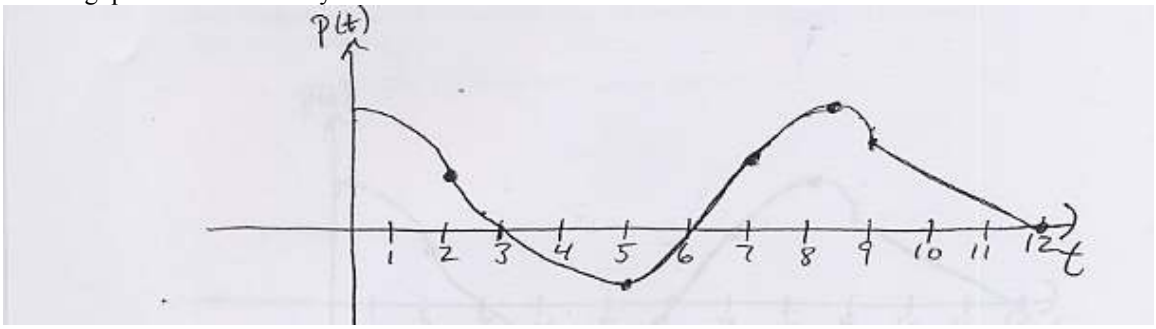
3. (4 points each) Steve has a gravel truck that he is constantly filling and emptying. At time t minutes, he has $g(t)$ tons of gravel in his truck. For each of the following statements, write an equation that represents the given statement using either g, g', or g'' (That is, your answers should look something like $g'(23) = 91$).

a. At 7 minutes, Steve's truck is dumping (losing) gravel at a rate of a half ton per minute.

b. At 5 minutes, Steve's truck is filling with gravel and the rate of fill is increasing at .1 tons per minute per minute.

c. At 4 minutes, Steve's truck has 2.8 tons of gravel in it.

4. (4 points each) The following is a graph of $p(t)$, which represents the position (in miles) at t hours that Sally is with respect to her home as she drives on an east-west road by which her home is situated. Assume that east is the "positive" direction and west is the "negative" direction. Using the graph, answer the following questions about Sally:



a. When is Sally at home?

b. When is Sally west of her home?

c. When is Sally moving in a westward direction?

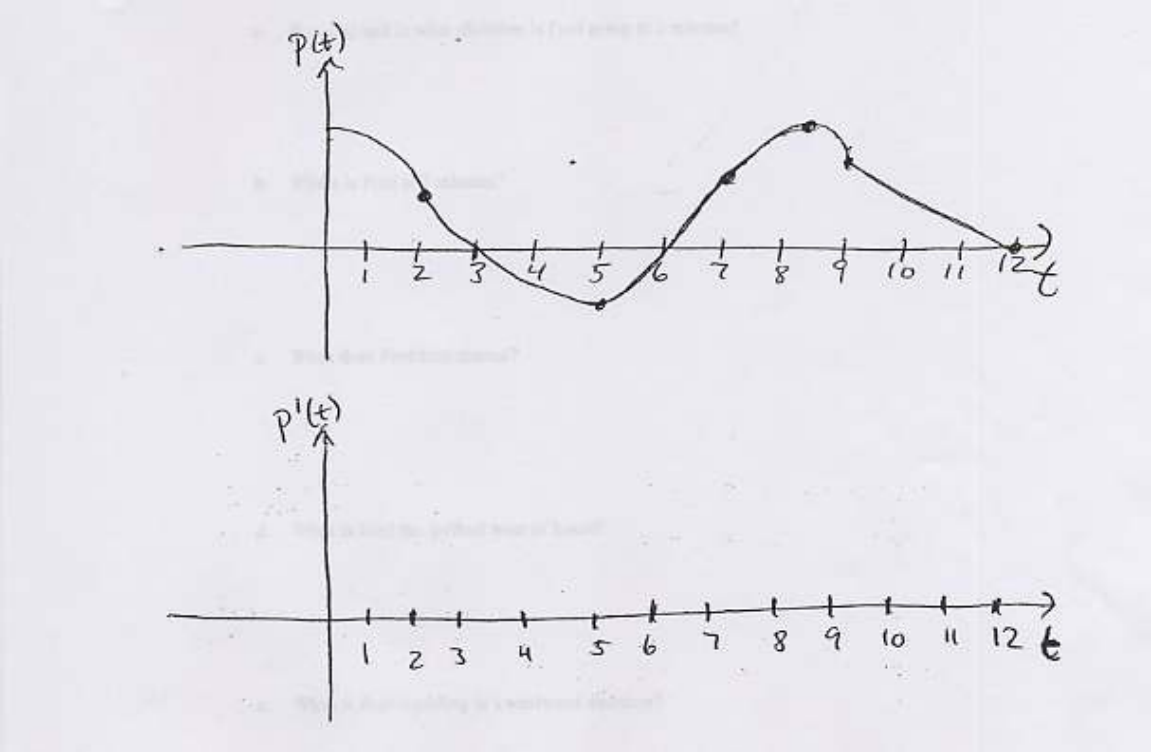
d. When is Sally the furthest from home?

e. When is Sally moving at a constant rate?

f. When is Sally moving the fastest?

g. When does Sally change her direction?

5. (10 points) Given the graph of $p(t)$ in #4, sketch a graph of $p'(t)$.



6. (4 points each) Fred lives on the same east-west road that Sally (from #4) does. However, Fred's position (in miles) from his house is given at t minutes by $f(t) = \frac{1}{3}t^3 - 4t^2 + 12t - 7$. We are only concerned about Fred for the first 10 minutes. Using only the formula (not the graph) of $f(t)$, answer the following questions about Fred:

a. How fast and in what direction is Fred going at 3 minutes?

b. Where is Fred at 3 minutes?

c. When does Fred turn around?

d. When is Fred the furthest west of home?

e. When is Fred traveling in a westward direction?

f. When is Fred traveling the fastest in a westward direction?

7. (5 points) Write equations of three lines parallel to the line tangent to $f(x) = x^5 - x^3 + 7x^2 - 8$ at x = 2.