

Math 124
Exam 3
November 30th, 2007

Name: _____

1. Your exam contains 5 questions and 5 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values vary and these are indicated on each problem. 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. If you need extra space, use the back of the exam and clearly indicate this.
5. You are allowed one 8.5×11 sheet of handwritten notes (both sides). Graphing and scientific calculators are permitted.
6. Leave answers in exact form or round to 4 decimal places.

Problem	Total Points	Score
1	10	
2	16	
3	32	
4	20	
5	22	
Total	100	

1. (10 pts.) Find a function $g(x)$ for which $g(1) = 3$ and $g'(x) = \frac{2}{x} - 3$ for $x > 0$.

2. (16 pts.) Suppose that $f(4) = 5$ and the **derivative** function is $f'(x) = \frac{2}{\ln x}$.

(a) (10 pts.) Estimate $f(4.1)$ using the tangent line approximation of f at $x = 4$.

(b) (6 pts.) Is your estimate from part (a) an overestimate or underestimate? Explain.

3. (32 pts.) $h(x) = 2\arctan x - \frac{x}{4}$ for all real values x .

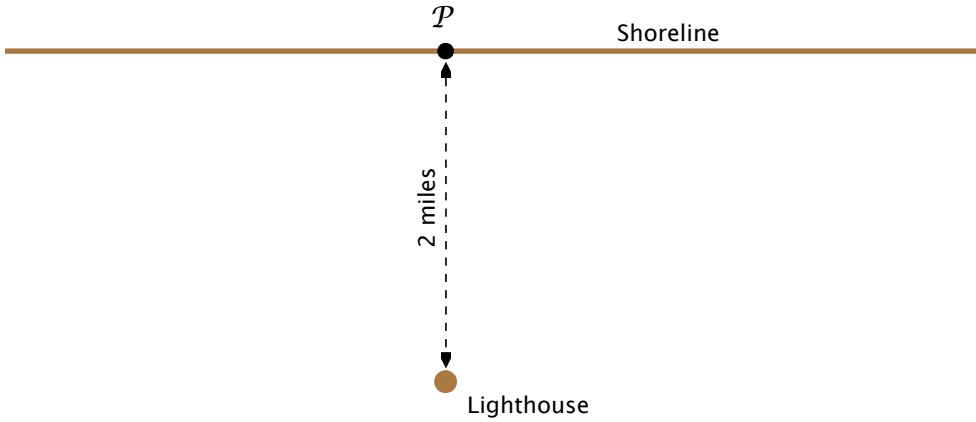
(a) (15 pts.) Find the intervals on which $h(x)$ is increasing and the intervals on which $h(x)$ is decreasing. Give exact answers.

(b) (9 pts.) What are the local maximum and minimum **values** of $h(x)$?

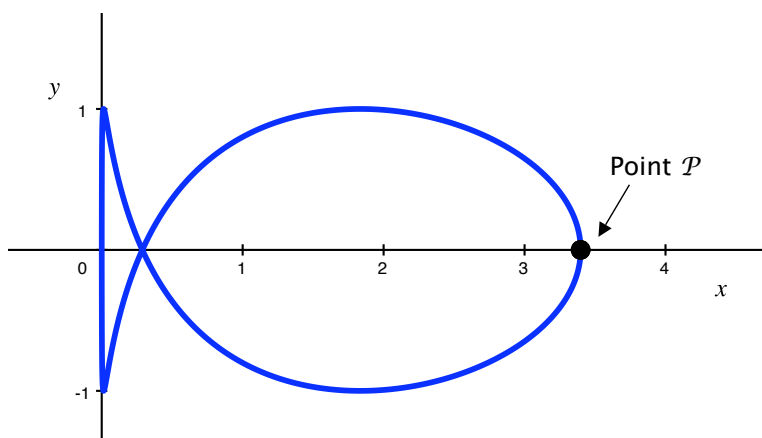
(c) (8 pts.) If the domain of $h(x)$ is restricted to $[-1, 5]$, find the absolute maximum and minimum values of h on the interval.

4. (20 pts.) A lighthouse is located on a small island 2 miles away from the nearest point P on a straight shoreline. The light at the top of the lighthouse rotates at 3 revolutions per minute.

How fast is the light beam moving along the shoreline when it is 2 miles from P ? Include units in your answer.



5. (22 pts.) Consider the following parametric curve.



$$x(t) = \frac{5}{4}e^{1-t^2}$$

for $-\pi \leq t \leq \pi$.

$$y(t) = \sin(2t)$$

(a) (8 pts.) Find the x -coordinate of the point P as shown in the figure given that P is on the x -axis. Give the exact answer.

(b) (14 pts.) Find the slope of the curve when $t = \frac{\pi}{2}$. (You can leave your answer in exact form or round it to 4 decimal places.)