Math 1151
MIDTERM 2
October 27, 2015
Form A

NAME : ___ ___ ___ ___ ___ ___ ___ ___

OSU Name.# : ___ ___ ___ ___ ___ ___ __

Lecturer: : ___ ___ ___ ___ ___ ___ ___

Recitation Instructor : ___ ___ ___ ___

Recitation Time : ___ ___ ___ ___ ___ __

INSTRUCTIONS

- **SHOW ALL WORK in problems 1, 2, and 5.**
  Incorrect answers with work shown may receive partial credit,
  but unsubstantiated correct answers may receive NO credit.

  You don't have to show work in problems 3 and 4.

- **Give EXACT answers unless asked to do otherwise.**

- **Calculators are NOT permitted!**
  PDA's, laptops, and cell phones are prohibited.
  Do not have these devices out!

- **The exam duration is 55 minutes.**

- **The exam consists of 5 problems starting on page 2 and ending on page 8.**
  Make sure your exam is not missing any pages before you start.

PROBLEM NUMBER	SCORE
1	(16)
2	(18)
3	(18)
4	(30)
5	(18)
TOTAL	(100)

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1. (16 pts)

(a) (6 pts) Fill in the blanks.

$$f'(x) = \lim \frac{\qquad\qquad}{h}$$

if the limit exists.

(b) (10 pts) Let $f(x) = \frac{1}{x+4}$.

Use the (limit) definition of derivative in (a) to find f'(x).

DO NOT USE THE PRODUCT OR QUOTIENT RULE ! SHOW YOUR WORK !

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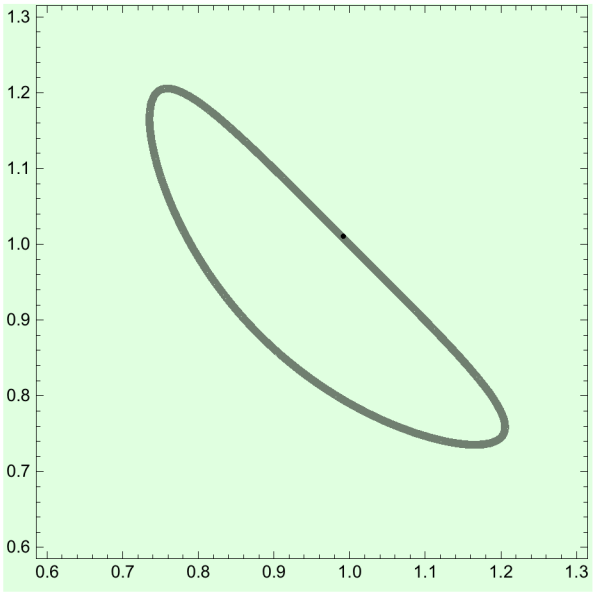
2. (18 pts) A part of the curve with equation $\cos(\pi xy) + x + y = 1$ is sketched below.



(a) Use implicit differentiation to find the derivative $\frac{dy}{dx}$.

(b) Consider the point $(1, 1)$. Show (algebraically) that this point lies on the curve.

(c) Find the equation of the line tangent to the curve at $(1, 1)$. Draw this line in the figure above.

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3. (18 pts) MULTIPLE CHOICE!!!

A table of values for f(x) and f'(x) is shown below. Suppose that f is a one-to-one function and $f^{-1}(x)$ is its inverse.

x	f(x)	f'(x)
1	3	4
3	4	5
4	6	3

CIRCLE THE CORRECT ANSWER IN EACH PART.

(I) **Evaluate $f^{-1}(f(x))$ at $x = 3$.**

(a) 1 ; (b) 3 ; (c) 6 ; (d) 4 ;

(e) DOES NOT EXIST ; (f) NONE OF THE PREVIOUS ANSWERS.

(II) **Evaluate $\frac{d}{dx} f(f(x))$ at $x = 3$.**

(a) 6 ; (b) 25 ; (c) 5 ; (d) 15 ;

(e) DOES NOT EXIST ; (f) NONE OF THE PREVIOUS ANSWERS.

(III) **Evaluate $\frac{d}{dx} \ln(f(x))$ at $x = 3$.**

(a) $\frac{1}{4}$; (b) 5 ; (c) $\frac{5}{4}$; (d) $\frac{1}{5}$;

(e) DOES NOT EXIST ; (f) NONE OF THE PREVIOUS ANSWERS.

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3. (CONTINUED)

(IV) **Evaluate $f^{-1}(x)$ at $x = 3$.**

(a) 4 ; (b) 1 ; (c) $\frac{1}{3}$; (d) 5;

(e) DOES NOT EXIST ; (f) NONE OF THE PREVIOUS ANSWERS.

(V) **Evaluate $\frac{d}{dx} f^{-1}(x)$ at $x = 3$.**

(a) 1 ; (b) 4 ; (c) $\frac{1}{5}$; (d) $\frac{1}{4}$;

(e) 5 ; (f) NONE OF THE PREVIOUS ANSWERS.

(VI) **Find the average rate of chnage of f over the interval [1, 3].**

(a) 2 ; (b) 1 ; (c) $\frac{1}{2}$; (d) 5 ;

(e) DOES NOT EXIST ; (f) NONE OF THE PREVIOUS ANSWERS.

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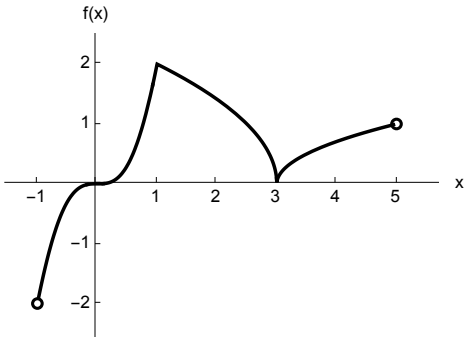
4. (30 pts) EXPLANATION IS NOT REQUIRED, AND NO PARTIAL CREDIT WILL BE GIVEN.

(I) The (entire) graph of a function f is shown in the figure below.



(a) Find the x - coordinates of all critical points of f (or write NONE).

ANSWER : critical point (s) at x =

(b) Find the x - coordinates of all local minima of f (or write NONE).

ANSWER : local min (s) at x =

(c) Find all values of x at which f attains its global minimum (or write NONE).

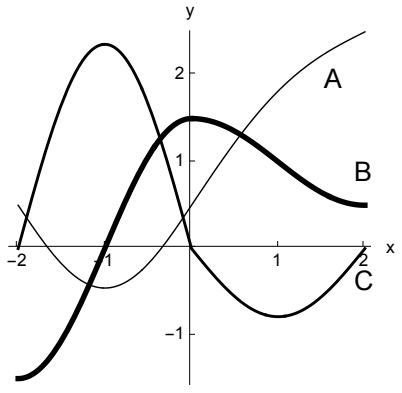
ANSWER : global min (s) at x =

(d) Find the interval (or intervals) on which the derivative of f is increasing.

ANSWER : derivative of f is increasing on

(II) The figure below shows the graphs of f, f ', and f ".

Which curve is which?



Fill in the blanks: **A = _ ; B = _ ; C = _** .

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4. EXPLANATION IS NOT REQUIRED, AND NO PARTIAL CREDIT WILL BE GIVEN.

(III) A function f' (derivative of f) is given
$f'(x) = (x-2)\,e^x$.

The following questions are about the function f.

(a) Find all critical points of f (or write NONE).

ANSWER : critical point (s) at x =

(b) On what interval (or intervals) is f increasing?

ANSWER : f is increasing on

(c) Find the point or points where f has a local maximum (or write NONE).

ANSWER : local max at x =

(d) Find the point or points where f has a local minimum.

ANSWER : local min (s) at x =

(e) Find $f''(x)$, the second derivative of f.

ANSWER : $f''(x)$ =

(f) Identify any inflection pionts.

ANSWER : inflection point (s) at x =

(g) Determine the intervals on which the function is concave up or concave down.

ANSWER : f is CONCAVE UP on

f is CONCAVE DOWN on

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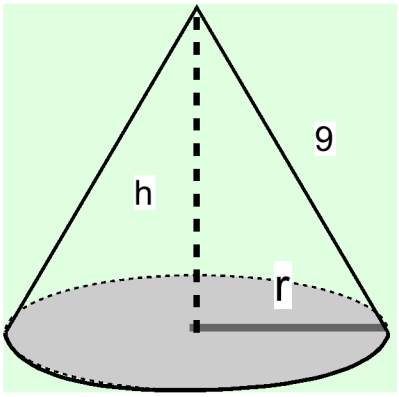
5. (18 pts) **A right cone has fixed slant height (see figure) of 9 ft.**
The cone ' s height is shrinking at a rate of 0.5 ft / sec.
At what rate is the area of the base changing when the height is 6 ft?



Make sure to label the picture.