Math 124 (Pezzoli)
Winter 2017
Midterm #2

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Name _____

TA: _____

Section: _____

Instructions:

- Your exam contains 5 problems. The entire exam is worth 70 points.
- Your exam should contain 6 pages; please make sure you have a complete exam.
- Box in your final answer when appropriate.
- Unless stated otherwise, you **MUST** show work for credit. No credit for answers only. If in doubt, ask for clarification.
- Your work needs to be neat and legible.
- You are allowed one 8.5×11 sheet of notes (both sides).
- The only calculator allowed is TI-30x IIS

Problem #1 (15 pts) _____

Problem #2 (15 pts) _____

Problem #3 (15 pts) _____

Problem #4 (10 pts) _____

Problem #5 (15 pts) _____

TOTAL (70 pts) _____

Problem 1 Compute the derivatives of the following functions. You do not need to simplify your final answer.

a) (5 points) $h(x) = \left(\frac{x}{2}\right)^{x^3+x-1}$

b) (5 points) $g(x) = \sqrt{1+\sqrt{1+ln(x)}}$.

c) (5 points) Let $f(x) = \sin(|x-3|)$ compute $f^{'}(2)$.

Problem 2 (15 points)

a) A round solar panel is to be constructed with radius 10 meters, but errors in the construction are inevitable.Use differentials to find a number δ with the property that, if the radius of the panel is within δ meters of the specified size, the area of the panel will be within 2 square meters of the desired area of 100 π meters.

b) The average daily power output of a round solar panel of radius r in your area is given by $f(r) = 265 - e^{-\frac{x-10}{5}}$ watts . You do not have a calculator available to calculate exponentials so you want to use the tangent line approximation to estimate the output if you increase the radius to 11 m. Approximately, what is $f(11)$?

c) Do you expect your estimate in b) to be an underestimate or an overestimate for the true value of f(11) ? Justify your answer without using a calculator to evaluate $f(11)$

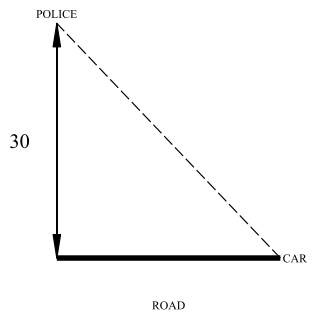
Problem 3 : Consider the curve C of equation $xy^2 + yx^2 = 2$

(a) (5 points) Find $y^{'}(x)$ by implicit differentiation.

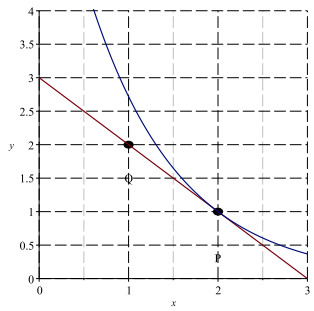
(b) (5 points) Find the coordinates of all points P on C where the tangent is horizontal.

(c) (5 points) Find the equation(s) of the line(s) tangent to C at P, for all the points P you have found in part b)

Problem 4 (10 points) Police are 30 feet from the side of the road. Their radar sees your car approaching at 80 feet per second when your car is 50 feet away from the radar gun, in other words your distance from the police car is changing at 80 feet per second when you are 50 feet away from the police. The speed limit is 65 miles per hour, which corresponds to 95 feet per second. Are you speeding ?



Problem 5 (15 points) An object is moving along the curve below with parametric equations $x = x(t)$, $y = y(t)$, the curve is tangent to the line PQ in the picture at the point P (2,1) .



a) When the object reaches P its vertical speed is 2 feet/ min , what is the horizontal speed $\dfrac{dx}{dt}$?

b) Explain why you expect your answer in a) to be negative

c) Find a value of the parameter k such that the line PQ in the picture above is tangent to the curve with parametric equations $x = 1.5\sin(t)$, $y = k\cos(t)$ at some point R.