MATH FOR BUSINESS: CALCULUS, SPRING 2017 - FINAL

Name: _____

Use this worksheet as the cover sheet for your write-up: write your name on this page, and staple this sheet to the front of your homework packet.

You will receive no credit for submitting solutions that the grader cannot read and understand—be sure to write legibly!

Answer **ALL** questions below, and only **ONE** bonus question.

Problem 1. Evaluate the following limits:

(1) $\lim_{x\to 2}(x^3+2x^2+1)$

(2) $\lim_{x\to -4}\dfrac{x^2+5x+4}{x^2+3x-4}$

Problem 2. Find the derivatives of the function using the definition of a derivative. State the domain of the function and its derivative:

$$f(x)=mx+b$$

Problem 3. Find the derivatives of each of the following functions:

(1) $y=\sqrt{x+\sqrt{x}}$ (2) $h(x)=\sqrt[3]{x+e^x}$

Problem 4. Find $\frac{dy}{dx}$ if $y=\ln(x^2+y^2)$

Problem 5. Find the critical points of the following functions:

(1) $f(x)=5x^2+4x$
(2) $f(x)=x^3+x^2-x$

Problem 6. Find the absolute minimum and maximum values of the function over the given intervals:

(1) $f(x)=3x^2-12x+5, \quad [0,3]$
(2) $f(x)=(x^2-1)^3, \quad [-1,2]$

Problem 7. Find the intervals of concavity and inflections points of the functions:

$$x^4-4x^3+6x^2-1$$

Problem 8. Find the limits of the following:

(1) $\lim_{x\to 4^-}\dfrac{3x}{x-4}$

(2) $\lim_{x\to 3^+}\ln(x^2-9)$

Problem 9. Evaluate:

$$\lim_{x\to\infty}\frac{x+3}{\sqrt{4x^2+1}}$$

Problem 10. Find the dimensions of a rectangle with perimeter $100m$ such that the area is maximized.

Problem 11. Bonus:
Find the general indefinite integral of:

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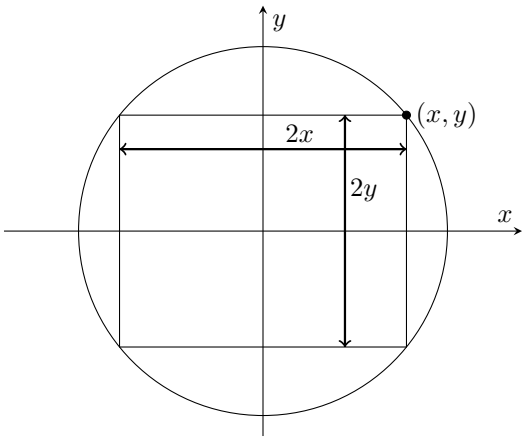
(1)

$$\int 12x^3 dx$$

(2)

$$\int (x + e^x) dx$$

Problem 12. Bonus.
Determine the largest rectangle that can be inscribed within a circle of radius 4. The diagram below should give some hint as how to approach this question.



Problem 13. Bonus:
Evaluate the integral by making the given substutition:

(1)

$$\int e^{-x} dx \quad u = -x$$

(2)

$$\int x^3 (2 + x^4)^5 dx \quad u = 2 + x^4$$