Math 12 - Calculus 1

math.mnrt.net **Term 1 – Exam 2** **Nov. 21, 2014**

Name: _____ Score: _____ of **181** points. Percent: _____ Grade: _____

- Partial credit is given. Clearly written well reasoned solutions make it easier for the grader to appreciate what you know. Messy or poorly reasoned solutions have the opposite effect.
- Answers must be completely simplified: no radicals in denominators, fractions in lowest terms, radicals simplified.
- All answers must be **exact** unless a question allows otherwise. This means that if the answer is $\sqrt{3}$ and you write 1.732050807568877293527446341505 9, your answer will receive zero points.
- A lot of space is provided following each question. That does not necessarily mean the solution is long.
- Unsupported answers, even if correct, will receive no credit. You must show how you arrive at your answers.

Additional instructions for take home exam.

- You may use your textbook, any other book, notes, and a calculator.
- You may not use the Internet.
- You may not communicate concerning the material on this exam with anyone. In particular, you are forbidden from communicating with a classmate.
- You are required to notify me if a classmate attempts to communicate with you about this material.
- If you have any questions about these rules, please ask me.
- Please work out your solutions as rough drafts on paper other than this exam paper. When you turn in this exam (on this paper) it should be your final draft of your best work.
- This exam is due by the end of the school day on Tuesday, Nov. 25, 2014.

1. (15 points) Find $f'(4)$, if $f(x) = \sqrt{x + \sqrt{x}}$.

2. (15 points) Find $\frac{dy}{dx}$, if $y = \sin^2(\cos^2 x)$.

3. (15 points) Find $\frac{dy}{dx}$, if $y = x^2 \sin^2 x$.

4. (15 points) Find $\frac{dy}{d\phi}$, if $y = \sin(\tan(\sec\phi))$.

5. (25 points) The pleasant curve shown in figure 1 is called the folium of Descartes. Find the equation of the line tangent to the folium of Descartes at the point $(3,3)$. The equation of the folium of Descartes is $x^3 + y^3 = 6xy$. Please write your answer in standard form ($ax + by = c$).

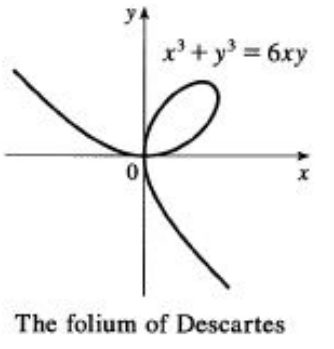

Figure 1: $x^3 + y^3 = 6xy$

6. Answer the questions below about the function $f(x) = 3x^4 - 6x^3 + 11$.

(a) (16 points) For what value(s) of x is $f(x)$ a global minimum. If there is no such value of x, say so.

(b) (16 points) On what interval(s) is f an increasing function? If nowhere, say so.

Question 6 continues...

(c) (16 points) On what interval(s) is f a decreasing function? If nowhere, say so.

(d) (16 points) On what interval(s) is f concave down? If nowhere, say so.

(e) (16 points) On what interval(s) is f concave up? If nowhere, say so.

(f) (16 points) For what value of x is a does f have a point of inflection? If there is no such value of x, say so.